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A FLORA OF CALIFORNIA

BY

WILLIS LINN JEPSON

Professor of Botany, University of California

ILLUSTRATED WITH MANY ORIGINAL FIGURES

PART VII

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A FLORA OF CALIFORNIA

by

WILLIS LINN JEPSON

Professor of Botany in the University of California

Consisting of an original descriptive account of the flowering plants of California, with critical notes on the species and illustrated with many original figures.

The work will be completed in two volumes, royal octavo, of about ten parts each, at a variable price per part. The following parts have appeared:

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ABBREVIATIONS

co.—county; *cos.*—counties.
acc.—according to.
type loc.—the station or locality where type specimen was collected.
type spm.—type specimen.
isl.—island.
comm.—communicated by.
det.—determined by.
locs.—stations listed under this paragraph heading are always Californian and within the geographic range for California, as indicated, unless definite statement is made to the contrary. Only selected specimens are cited—those which best represent the species and most effectively validate the range.

½ to 1½ inches long; flowers white or pale blue, 6 to 8 lines broad; sepals 5 (or 6); achenes puberulent, with short recurved style.

Shady woods in mountains, mostly near the coast, 200 to 5000 feet: Santa Cruz Co. to Siskiyou Co. North to British Columbia, thence east to the Atlantic. Mar.-June.

Locs.—Santa Cruz Mts., *M. S. Baker;* Kings Mt., San Mateo Co., *C. F. Baker* 323; Mill Valley, *Jepson;* Ft. Ross, *Davy* 1674; Sonoma Creek Cañon, *M. S. Baker;* Humboldt Bay, *Tracy* 2949; Trinity Summit, *Davy* 5744; Marble Mt., *Chandler* 1551.

Refs.—ANEMONE QUINQUEFOLIA L. Sp. Pl. 1:541 (1753), type loc. Virgina. Var. GRAYI Jepson, Fl. W. Mid. Cal. 198 (1901). *A. nemorosa* Brew. & Wats. Bot. Cal. 1:4 (1876), not L. *A. nemorosa* var. *grayi* Greene, Fl. Fr. 295 (1892). *A. grayi* Behr. & Kell. Bull. Cal. Acad. 1:5 (1884), type loc. Lagunitas, Mt. Tamalpais.

10. **TRAUTVETTERIA** F. & M.

Perennial herbs. Leaves alternate, simple, palmately cleft, mostly basal. Stems branching at summit and bearing loose corymbose cymes of white flowers. Sepals 3 to 5, broad, white, petal-like, caducous. Petals none. Stamens numerous, filaments elavate, white, conspicuous. Achene utricular, capitate on the short receptacle.—Species 2, North America and Asia. (E. R. Trautvetter, Russian botanist, 19th century.)

1. **T. grandis** Nutt. Stems 1½ to 3 feet high; leaves deeply about 5-cleft, 2½ to 8 inches broad, unequally serrate, the basal long-, the cauline short-petioled; flowers 6 to 8 lines broad; sepals oval or roundish, concave, 2 lines long; achenes glabrous.

Mountain woods, northern California from Plumas Co. to Siskiyou Co. North to British Columbia.

Locs.—Mill Creek, Plumas Co. (acc. Bot. Cal. 2:425); Marble Mt., *Chandler* 1601.

Ref.—TRAUTVETTERIA GRANDIS Nutt.; T. & G. Fl. 1:37 (1838), type loc. shady woods, Columbia River, *Nuttall.*

11. **THALICTRUM** L. MEADOW RUE.

Perennial herbs with mostly tall erect stems from a short rootstock. Leaves bi- or tri-ternately compound, with petiolulate (or some sessile) leaflets. Flowers many, small (1½ to 3 lines long), panicled, rarely in a raceme, dioecious, or sometimes perfect. Sepals 4 (or 5 to 7), greenish, or more or less petal-like. Petals none. Stamens numerous with long mucronate anthers on capillary filaments. Achenes 4 to 15, veined or furrowed, sometimes inflated, tipped with the persistent long styles.—Species about 80, all continents except Australia, but chiefly north temperate North America, Europe and Asia. (Greek thallo, to grow green, the application uncertain.)

Flowers in a simple raceme, perfect, nodding; alpine or subalpine dwarf .....1. *T. alpinum.*

Flowers in a panicle; tall plants, mostly of the foothills and middle altitudes.

Flowers perfect; achenes stiped .....2. *T. sparsiflorum.*

Flowers dioecious; achenes not stiped or scarcely so.

Achenes broad, strongly oblique both ventrally and dorsally; common.

Sides of achene 3 or 4-ribbed .....3. *T. fendleri.*

Sides of achene with branching nerves, at most 1-ribbed .....4. *T. polycarpum.*

Achenes narrow, scarcely oblique; rare .....5. *T. occidentale.*

1. **T. alpinum** L. Stems 3 to 6 inches high; leaves basal, short-petioled, 1 to 1½ inches long, ternate, the lateral divisions with 3, the terminal with 5 leaflets; leaflets notched, 3-cleft or -divided, 1½ to 2 lines long; flowers in a simple raceme, perfect, purplish, nodding; achenes slightly flattened, sessile, 4 or 5-ribbed on the sides, 1 to 1¼ lines long.

Cottonwood Creek, White Mts., acc. *Coville.* Nevada to Colorado, north to the Arctic. Circumpolar. It is probable that this species once occupied most

of the northern hemisphere south of the great glaciers.—Avebury, Brit. Fl. Plants, 49.

Refs.—THALICTRUM ALPINUM L. Sp. Pl. 1:545 (1753), type European; Cov. Contrib. U. S. Nat. Herb. 4:55 (1893).

2. **T. sparsiflorum** Turez. Stems erect, slender, 2 to 2½ feet high; flowers perfect, few in a narrow panicle; leaflets small (6 to 10 lines long); ovaries densely and minutely glandular; achenes very minutely glandular-dotted, shortly stiped, 2½ lines long, 1¼ to 1½ lines wide, strongly oblique (half-obovate), with the dorsal angle straight, the sides with 3 or 4 veins curving upward and inward from the base and more or less branching above.

High mountains, 5000 to 9500 feet: San Bernardino Mts. and Sierra Nevada. East to the Rocky Mts., north to Alaska. Asia.

Locs.—Mt. San Gorgonio, *Geo. B. Grant;* Poison Meadow, Tulare Co., *Jepson* 1126; Pine Ridge, Fresno Co., *Hall & Chandler* 142; upper San Joaquin River, Madera Co., *Congdon;* Truckee, *Heller* 7056; Pine Creek, Lassen Co., *Baker & Nutting.*

Ref.—THALICTRUM SPARSIFLORUM Turez.; F. & M. Ind. Sem. Petrop. 1:40 (1835), type Asiatic.

3. **T. fendleri** Engelm. Stems 2 to 3 feet high; herbage glabrous; leaflets roundish, 5 to 8 lines long, incised or crenate, the teeth mostly rounded but apiculate; panicle 3 to 6 inches long or with accessory panicles from the upper axils; sepals mostly white-searious, elliptie to ovate, mostly obtuse; achenes 2 to 3 lines long, 1 to 2 lines broad, irregularly oval in outline, more oblique ventrally, the sides 3 or 4-nerved or -ribbed, the central nerve most prominent, the lateral often branched, or merely with irregular branching nerves on the sides.

Sierra Nevada and mountains of Southern California, mostly at higher altitudes. East to New Mexico. The number, development, and branching of the nerves on the sides of the achene is so variable that this character must be used with eaution.

Locs.—Golden Trout Creek, Tulare Co., *Jepson* 4933; Nellie Lake, Fresno Co., *A. L. Grant* 1078; Stubblefield Cañon, Yosemite Park, *Jepson* 4539; Summit, Nevada Co., *Jepson.*

Var. **hesperium** Jepson n. comb. Infloreseence and achenes very sparsely glandular-puberulent; achenes flattened.—California, range of the species and passing into it, perhaps scarcely worth definition: Glen Alpine, *Katharine Chandler;* Round Mdw., Giant Forest, *Jepson* 710.

Refs.—THALICTRUM FENDLERI Engelm.; Gray, Mem. Am. Acad. 4:5 (1849), type loc. Mora Creek, New Mexico, *Fendler.* Var. HESPERIUM Jepson. *T. hesperium* Greene, Pitt. 2:24 (1889). *T. fendleri* var. *platycarpum* Trel. Proc. Bost. Soc. Nat. Hist. 23:304 (1885), based on California material; not T. platycarpum Hook. & Th.

4. **T. polycarpum** Wats. Stems 2 to 3 (or 6) feet high; herbage glabrous throughout; leaflets rather prominently veined beneath; sepals elliptie to ovate, mostly aeute; achenes many, somewhat inflated, the sides marked with anastomosing veins and mostly with a salient rib down the middle.

Coast Ranges and Southern California, mostly of the foothills or of lower altitudes.

Locs.—Van Duzen River Valley, *Tracy* 2679; Ross Valley, Marin Co., *Jepson;* Berkeley, *Jepson;* Niles, *Jepson;* Crystal Springs Lake, *C. F. Baker* 692; Nacimiento River, *Jepson* 1696; Santa Maria, *Ida M. Blochman;* Arroyo Seco, San Gabriel Mts., *Peirson* 53; Palomar, *Jepson* 1503*a*; San Diego, *Abrams* 3423.

Var. **caesium** Jepson n. comb. Glaucous throughout; achenes less turgid, the sides simply with anastomosing veins.—Central and northern Sierra Nevada foothills and lower altitudes. Perhaps better regarded as identical with the species, but in any event illustrated by the following: near Chico, *Greene;* Calaveras Co. (acc. *Greene*); Hetch-Hetchy, *Jepson* 3643 (Black Oak opens).

Refs.—THALICTRUM POLYCARPUM Wats. Proc. Am. Acad. 14:288 (1879); Jepson, Fl. W. Mid. Cal. 202 (1901). *T. fendleri* Engelm. var. *?polycarpum* Torr. Pac. R. Rep. 4:61 (1857), as to Napa Valley plants. *T. ametrum* Greene, Muhl. 5:129 (1909), type loc. seaward Coast Range. *T. mendocinum* Greene, l.c., type loc. Round Valley, *Chesnut;* achenes nearly veinless. —Ex. char. *T. latiusculum* Greene, l.c., 130, type loc. Mt. Sanhedriu, *Heller* 5855. *T. magarum*

Greene l.c., type loc. Witch Creek, San Diego Co., *Alderson*. Var. CAESIUM Jepson. *T. caesium* Greene, Fl. Fr. 309 (1892), type loc. Sierra foothills, *Greene;* cf. K. Brandegee, Zoe, 4:81 (1893).

5. **T. occidentale** Gray. Leaflets 1 to 2 inches long; achenes few, lanceolate or oblong-lanceolate, acuminate, scarcely oblique, 3 to 4 lines long, ¾ to 1 line wide, the sides with 3 prominent ribs or nerves.

Moist shady places, extreme northern California. North to British Columbia, thence east to the Atlantic. Rare with us.

Locs.—Plumas Co. (acc. Syn. Fl. 1¹:16); Wooley Creek, w. Siskiyou Co., *Butler* 359.

Ref.—THALICTRUM OCCIDENTALE Gray, Proc. Am. Acad. 8:372 (1872), type from Ore., *E. Hall.*

12. MYOSURUS L.

Dwarf annuals with entire tufted basal leaves and naked 1-flowered scapes. Flowers whitish or yellowish, small (1½ to 2 lines broad). Sepals 5, spurred at base. Petals 5, with a nectar-bearing hollow at the summit of the slender claw. Stamens 5 to 20. Achenes numerous, crowded on a long and slender spike-like receptacle. Ovules attached near the summit of the cell.—Species 7, all continents. (Greek mus, a mouse, and oura, a tail, in allusion to the curious receptacles.)

Flowers raised on scapes; achenes with an appressed beak.

Back of achene narrow, its keel ending in a straight or spreading subulate beak ..... 1. *M. aristatus.*

Back of achene rhomboidal, flattish, its low keel ending in a short or nearly obsolete beak ..... 2. *M. minimus.*

Flowers sessile in a close cluster on the ground, or shortly scapose; achenes with a spreading beak ..... 3. *M. alopecuroides.*

1. **M. aristatus** Benth. Scapes several, ¾ to 1¾ inches high; leaves mostly shorter than the scapes; petals present or wanting; spike-like receptacles 2 to 4 lines long; achenes thin-walled, the narrow back continued into a subulate straightish or spreading beak.

Mountains of the western United States. Occurring in extreme northern California; also in Bear Valley, San Bernardino Mts. (acc. *Parish*).

Var. **lepturus** Jepson n. comb. More slender, 1 to 3 inches high; carpels beakless or very short-pointed; carpel-spike 3 to 8 lines long.—Range of the species: Livermore and Sacramento valleys (acc. Greene, Fl. Fr. 296).

Refs.—MYOSURUS ARISTATUS Benth. in Hook. Lond. Jour. Bot. 6:458 (1847), type loc. Camas Prairie, Coeur d'Alene, Ida., *Geyer* 332; (cf. a paper by Tidestrom on this species, Torreya 16:228–230, fig. 1,—1916). *M. apetalus* of N. Am. authors, not of Gay; Parish, Zoe 4:161 (1893). Var. LEPTURUS Jepson. *M. apetalus* var. *lepturus* Gray, Bull. Torr. Club 13:2 (1886), based on spms. from n. Cal., *Lemmon*, and Ore., *Howell.*

2. **M. minimus** L. MOUSE TAIL. Scapes 2 to 6 inches high, the slender spike-like receptacles ½ to 1¾, commonly about 1 inch long; leaves linear-filiform, 1 to 2 inches long; mature achenes with somewhat rhomboidal back and very low keel ending in a straight appressed or rarely obsolete tip.

Low ground: inner Coast Ranges; Sacramento and San Joaquin valleys; far eastward. Back of achene broader than in the preceding.

Locs.—Tulare, *Davy* 3083; Mt. Eden, Alameda Co., *K. Brandegee;* lower San Joaquin, *Bioletti;* Vacaville, *Greene;* Haas Slough, Solano Co., *Jepson;* Dixie Mts., Lassen Co., *M. S. Baker;* Modoc Co., *E. M. Austin.* The plant from Livermore Valley (*Greene*), cited by Huth as the type of M. brevicarpus var. californicus Huth in Engler, Bot. Jahrb. 16:285 (1893) probably should be listed here.

Var. **apus** Greene. Spike-like receptacles nearly or quite sessile in a cluster amongst and shorter than the leaves.—Lower San Joaquin Valley; San Diego Co.; Lower California. This variety is referred to M. sessilis Wats. (type loc. Umatilla Co., Ore.) by Huth (Engler, Bot. Jahrb. 16:285,—1893). We have seen no specimens of M. sessilis from Oregon.

Var. **filiformis** Greene. Scapes 1 to 6 inches high; receptacles not tapering, very slender, almost thread-like.—San Francisco and Antioch, acc. *Greene.*

Refs.—Myosurus minimus L. Sp. Pl. 284 (1753), type European; Jepson, Fl. W. Mid. Cal. 198 (1901). *M. major* Greene, Pitt. 3:257 (1898), type loc. Yreka, *Greene* (recognized by J. C. Nelson, Torreya, 18:194,—1918). Var. apus Greene, Bull. Cal. Acad. 1:277 (1885), type loc. mesas, San Diego, *Orcutt*. Var. filiformis Greene, l.c., type loc. Guadaloupe Isl., *Greene*.

3. **M. alopecuroides** Greene. Leaves 1 line wide, ½ to 2½ inches long; spike-like receptacle slender-conical, rather thick, 3 or 6 to 10 lines long, sessile or very shortly scapose, in clusters of about 4 to 9; achenes not flattened on the back, thin-walled and with prominent spreading beak.

Shallow vernal pools of alkaline flats: western side of the lower Sacramento and lower San Joaquin valleys. Mar.-Apr.

Locs.—Vacaville, *Jepson;* Antioch.

Refs.—Myosurus alopecuroides Greene, Bull. Cal. Acad. 1:278 (1885), type loc. Antioch, *Curran;* Jepson, Fl. W. Mid. Cal. 198 (1901).

13. RANUNCULUS L. Buttercup. Crowfoot.

Annual or perennial herbs with divided or entire leaves. Flowers solitary or somewhat corymbed, yellow, or less commonly white, rarely pink. Sepals 5, rarely 4 or 3. Petals 5 (rarely 1 or 3) to 16, with a little nectar-bearing pit at base, the pit commonly covered by a scale. Stamens usually numerous. Achenes numerous, in a globular or oblong cluster. Seed attached near the base of the cell.—Species about 250, all continents. (Latin name for a little frog, some species growing in wet places where frogs are found.)

Variation Note.—The leaves are always variable in shape or size on a given individual, commonly markedly so. In our species the petals are commonly 5, or varying to 6 or 7, except in R. californicus and R. canus, which have many petals. R. hebecarpus has only 1 to 3 petals.

Ecolog. Note.—Our species, for the most part, grow in the moist vernal beds of winter pools, on the margins of streams or rivulets, or in swamps or wet meadows. A few are amphibious and float in water but none are characteristic of arid places except R. andersonii, which inhabits sagebrush slopes of the great interior plateau. R. californicus should be mentioned in this connection. While it grows in a variety of moist and low habitats, where it produces a corresponding number of indefinable leaf forms, the prevailing form abounds on the open slopes of the coast hills. It is a tropophyte, our only species which has accommodated itself to the dry naked hills, but its period of development corresponds to the months of the winter and spring rains when the soil is continuously moist. It is, furthermore, not only our most abundant but our most variable species. In drier regions, i.e., towards the interior, it is less common on the hills and favors low ground; likewise, in Southern California, it is all but confined to cienagas and wet swales. One may also note Ranunculus hebecarpus which is enabled to tolerate the dryness of the soil where it grows by favoring exclusively the shade of oak or other trees in open woods of the drier foothills.

A. Nectar-bearing pit on petal claws covered with a scale.

1. *Achenes with a firm close coat, not loose or utricular.*—Subgenus Euranunculus.

Aquatic; perennials.

Leaves finely dissected ..... 1. *R. delphinifolius.*

Leaves cordate, entire ..... 2. *R. hydrocharoides.*

Terrestrial plants, often in muddy or marshy places, but not truly aquatic or floating.

Achenes not spiny-muricate, nor with hooked hairs.

Leaves simple, entire; achenes thickish.

Perennials; petals 5, medium to showy; achenes not papillate.

Stems erect or ascending from a cluster of fibrous roots, not rooting at the nodes.

Leaves glabrous or slightly hairy; stems mostly leafy; achenes turgid, glabrous 3. *R. alismaefolius.*

Leaves mostly densely pilose; stems naked or nearly so; achenes turgid, pubescent ..... 4. *R. lemmonii.*

Stems filiform, creeping or decumbent, rooting at the nodes ..... 5. *R. flammula.*

Annuals; basal leaves ovate; petals 1 to 3, minute; achenes papillate .. 6. *R. pusillus.*

Leaves (or some of them) toothed, lobed or divided.
Herbage glabrous or nearly so; achenes thick or plump.
Perennials; low plants; alpine or northern.
Basal leaves nearly or quite as broad as long, rounded or truncate at base, 3-lobed at apex or entire ..... 7. *R. glaberrimus.*
Basal leaves broader than long, subcordate, 3 (or 5) -parted and coarsely toothed ..... 8. *R. eschscholtzii.*
Annuals; stems fistulous ..... 9. *R. sceleratus.*
Herbage pubescent or hirsute; leaves lobed or divided, mostly compound; perennials.
Beak of the achenes commonly curved, much shorter than the body, rarely as long.
Stems commonly rather coarse, mostly erect and rather tall; achenes strongly flattened.
Corolla pale or whitish, very small; beak of achene like a grab-hook ..... 10. *R. bongardii.*
Corolla golden, showy; sepals reflexed.
Beak deltoid, slightly curved at the acute tip; petals 5 to 10 ..... 11. *R. canus.*
Beak narrowly or broadly subulate, not deltoid.
Petals 9 to 16; beak very short, stoutish, rather closely recurved .... 12. *R. californicus.*
Petals 5 or 6; beak rather slender, falcate-curved but more or less erect ..... 13. *R. occidentalis.*
Stems creeping or reclining; achenes roundish or turgid, the beak curved or, if straight, at least hooked at tip; sepals not reflexed.
Corolla showy; achene margined; beak somewhat recurved ..... 14. *R. repens.*
Corolla small; achene not margined; beak nearly straight ..... 15. *R. macounii.*
Beak of the achenes straight, as long as the body; sepals reflexed; stems spreading or ascending.
Leaflets toothed or laciniate.
Petals 5, emarginate; leaflets crenate, mostly not lobed .... 16. *R. bloomeri.*
Petals 5 to 8, rounded at apex; leaflets deeply 3-cleft or laciniate ..... 17. *R. orthorhynchus.*
Leaflets or their divisions with entire margins, not serrate or laciniate ..... 18. *R. marmorarius.*
Achenes prickly or with stiffish hooked hairs; annuals.
Flowers minute; achenes with hooked hairs; delicate plant ..... 19. *R. hebecarpus.*
Flowers medium; achenes spiny-muricate, with raised border.
Leaves cleft into 3 to 5 lobes, the lobes toothed; border of achene beveled, not spiny ..... 20. *R. muricatus.*
Leaves deeply 2 or 3 times divided; border of achene spiny ..... 21. *R. arvensis.*

2. *Achenes utricular or with a thin coat; perennials.*

Leaves much dissected; flowers pink; achenes strongly inflated.—Subgenus CRYMODES ..... 22. *R. andersonii.*

Leaves cordate, lightly crenate; flowers yellow; achenes thin-walled, striate; receptacle elongated-oblong; stems creeping.—Subgenus HALODES ..... 23. *R. cymbalaria.*

B. Nectar-bearing pit on petal claws naked; leaves or some of them filiform-dissected; flowers white; aquatic.—Subgenus BATRACHIUM.

Leaves immersed, all filiform-dissected, or rarely some floating leaves 3-parted into broad rounded lobes ..... 24. *R. aquatilis.*

Leaves floating, with 3 broad divergent narrowly ovate lobes, or some submersed leaves capillary-dissected ..... 25. *R. lobbii.*

1. **R. delphinifolius** Torr. YELLOW WATER CROWFOOT. Aquatic perennial; stems fistulous, 1 to 2 feet long; leaves three or four times ternately dissected into linear-filiform acuminate segments; flowers golden-yellow, showy (8 to 13 lines broad), on naked fistulous peduncles ¾ to 2¼ inches long; petals 5 or 6, broadly obovate; scale of the nectary pit prolonged upwards into narrow or broad wings attached by one edge to the petal and often with free tips, the whole structure conspicuous, ¼ to ⅓ as long as the petal, but apparently variable in form and size; achenes turgid, callous-margined at base and ventrally with a tumid ridge, ¾ line long, the subulate beak over half as long.

Stagnant ponds or pools or slow-flowing streams: Humboldt Co.; Modoc Co. North to British Columbia, east to the Atlantic. Siberia. Rarely collected in California.

Locs.—Grouse Creek, Humboldt Co., *Chesnut & Drew;* ne. Modoc Co., *Manning* 126.

Refs.—RANUNCULUS DELPHINIFOLIUS Torr.; Eaton, Man. ed. 2, 395 (1818), type loc. presumably e. U. S. *R. multifidus* Pursh, Fl. 736 (1814), not Forsk.

2. **R. hydrocharoides** Gray. Aquatic perennial; stems rather slender, sparingly branched above, 3 to 8 inches high from a coarse but short vertical rootstock, which also produces creeping stems; leaves mostly basal, these long-petioled, simple, ovate to cordate, entire, undulate and somewhat callous-margined, 5 to 12 lines long, a little succulent; flowers 2½ to 3½ lines broad; upper leaves obovate or spatulate; achenes ¾ line long.

Marshes and springs: Owens Valley, *Gray;* (?)Dead Horse Cañon, Siskiyou Co., *M. S. Baker* (leaves 1 to 1¾ inches long). Arizona to Mexico. Aspect suggestive of a small Sagittaria.

Refs.—RANUNCULUS HYDROCHAROIDES Gray, Pl. Thurb. 306 (1854), type loc. Mabibi, Sonora, Mex., *Thurber;* Syn. Fl. 1¹:26 (1895).

3. **R. alismaefolius** Geyer. Stems stout, somewhat fistulous, erect, sparingly branched above, several-flowered, 8 to 18 inches high, arising from a short perennial rootstock bearing thick-fibrous roots; herbage glabrous, rarely a little hairy; leaves oblong-lanceolate or lanceolate, 2½ to 6 inches long, mostly 5 to 8 (or 12) lines broad, tapering to apex, and at base usually tapering gradually into the petiole, the basal and lower leaves long-petioled, the upper shortly petioled or sessile, entire or commonly a few on a plant obscurely serrulate; flowers 8 to 10 lines broad; petals 5, roundish obovate; achenes smooth, glabrous, turgid, 1 line long, with a short-subulate introrse beak.

Swamps in Mendocino and Humboldt cos. North to British Columbia and Idaho.

Locs.—Long Valley, *Bolander* 4730; Burr Valley, Buck Mt., *Tracy* 4155.

Var. **hartwegii** Jepson n. comb. Stems slender, not fistulous, ascending, 3 to 13 inches high, usually a little leafy, simple or sparingly branched, but umbellately 3-flowered at summit; stems and petioles hairy or glabrous; leaves lanceolate or oblong lanceolate, 1 to 4 inches long, tapering gradually into the petiole or the uppermost sessile or nearly so; petioles about half as long as the blade, rarely longer; flowers 5 to 8 lines broad; achenes with short-filiform or slender beak.—Higher altitudes (4500 to 9000 feet) in the Sierra Nevada from Tuolumne Co. north to Siskiyou Co., thence southwesterly to northern Trinity Co. This variety passes into var. alismellus, although the two in their extreme forms are quite different.

Locs.—Sonora Pass, *A. L. Grant* 147; Twin Lakes, Alpine Co., *Hansen* 1306; Lake Tahoe, *Anna King;* Prosser Creek, *Sonne;* Big Mdws., Plumas Co., *R. M. Austin;* Lassen Peak, *Jepson* 4091; Modoc Co., *M. S. Baker;* Medicine Lake, Siskiyou Co., *M. S. Baker;* Goosenest Mt., *Butler* 1322; Salmon Mts., *Hall* 8617.

Var. **alismellus** Gray. (Fig. 106.) Leaves thin, mostly or usually wholly basal, these and the stems in dense tufts; stems 2 to 10 inches high, commonly simple and 1-flowered, naked or 1 or 2-leaved; herbage glabrous, sometimes slightly hairy at base; leaves ovate to oblong-lanceolate, 4 to 12 lines long, on petioles as long or longer, the few stem leaves nearly sessile; flowers 3 to 6 lines broad.—Alpine or subalpine wet meadows or shallow streamlets, 7000 to 10,500 feet, often filling gravelly meadows with golden bloom: Sierra Nevada; far North Coast Ranges; high mountains of Southern California. July.

Locs.—In its most extreme form this is a plant with the leaves all basal in a dense compact even tuft and the strictly naked simple 1-flowered scapes rising an inch or two above them; the leaves are mostly broad (ovate, oval or elliptic), with the blade clearly defined from the petiole. Such plants are rather characteristic of sloping gravel drifts with trickling water ("snow runs") or wet sandy meadows, as for example about Smedberg Lake, Yosemite Park (*Jepson* 3380). More commonly the scapes are sparingly leafy but only 1-flowered, rarely 2 or 3-flowered. The following specimens verify the range of var. alismellus.—Sierra Nevada: Lassen Peak, *Jepson* 4095; Donner Pass, *Heller* 7010; Yosemite Park, *Jepson* 4503 (Benson Pass), 3232, 3236 (Vogelsang Pass); Huntington Lake, Fresno Co., *A. L. Grant* 1030; Mt. Silliman, *Jepson* 748; East Fork Kern River, *Jepson* 5048; Templeton Mt., Tulare Co., *Jepson*

4975. North Coast Ranges: Trinity Summit, *Jepson* 2106; South Yollo Bolly, *Jepson*. Southern California: Bear Valley, San Bernardino Mts., *Parish* 3693; Mt. San Jacinto, *Hall* 2405.

Refs.—RANUNCULUS ALISMAEFOLIUS Geyer; Wats. Proc. Am. Acad. 14:289 (1879); Geyer's Idaho material at Kew (Herb. Benth.) is taken by us as the type; we noted while at Kew that it has an excellent match in *Abrams* 579, Paradise Creek, Latah Co., Ida. *R. bolanderi* Greene, Bull. Cal. Acad. 2:58 (1886), type loc. Long Valley, central Mendocino Co., *Bolander* 4730. Var. HARTWEGII Jepson. *R. hartwegi* Greene, Erythea, 3:45 (1895), based on *R. alismaefolius*, var. Benth. Pl. Hartw. 295 (1848), type loc. Bear Valley, Nevada Co., *Hartweg* 1627; (in Sierran specimens the petioles and stems may be hairy or glabrous, even on the same plant). Var. ALISMELLUS Gray, Proc. Am. Acad. 7:327 (1868), type loc. Yosemite Park (Lake Tenaya and Mt. Dana, *Bolander*). *R. alismellus* Greene, Fl. Fr. 297 (1892).

Fig. 106. RANUNCULUS ALISMAEFOLIUS Geyer var. ALISMELLUS Gray. Plant, × ½.

4. **R. lemmonii** Gray. Perennial; stems scape-like, 4 to 7 inches high, these and the leaves from a small short or globose rootstock bearing numerous stoutish fibres; scapes glabrous, simple or 3-branched near the ground or midway, with a pair of opposite bracts or leaves below the middle; leaves lanceolate, pilose, 1½ to 3½ inches long, drawn down to petioles as long or nearly (and strongly dilated at base); flowers 6 to 9 lines broad, solitary on the scape or its scape-like branches; petals 5, rarely 6 or 7, obovate or oblong; achenes in a globose head, very turgid, minutely pubescent, the beak very short.

Dry plains or valleys in the mountains, eastern slope of the Sierra Nevada in Sierra and Nevada cos., 5000 feet. May. Very nearly related to R. alismaefolius var. hartwegii.

Locs.—Sierra Valley; Truckee, *Sonne*.

Ref.—RANUNCULUS LEMMONII Gray, Proc. Am. Acad. 10:68 (1874), type loc. Sierra Valley, *Lemmon*.

5. **R. flammula** L. SPEARWORT. Perennial; stems slender or almost filiform, decumbent or creeping, rooting at the nodes, 3 to 13 inches long; leaves lanceolate, linear- or oblong-lanceolate or oblong-ovate, entire, ½ to 1¾ inches long, tapering into petioles ½ to 2½ inches long, or sometimes sessile; flowers 2 to 5 lines broad, terminating leafy stems or naked scape-like peduncles 1 to 2 inches high; achenes comparatively few, thick, less than ½ to 1 line long, the beak short.

Margins of lakes or shallow slow meadow-streamlets: North Coast Ranges; Sierra Nevada at middle altitudes; San Bernardino Mts. July.

Locs.—North Coast Ranges: Pt. Reyes, *Jepson* 1167; Mt. Hanna, Lake Co., *Jepson;* Ft. Bragg, *W. C. Mathews;* Humboldt Bay, *Chandler* 1130; Shackelford Creek, w. Siskiyou, *Butler* 1741; Sisson, *Jepson*. Sierra Nevada: Goose Lake, *Austin & Bruce;* Prattville, *T. Brandegee;* Bear Valley, Nevada Co., *Jepson;* Placer Co., *Hardy;* Silver Lake, Amador Co., *Hansen* 552; Heteh-Hetchy, *A. L. Grant* 882; Yosemite Valley, *Hall* 9086; Dinkey Creek, Fresno Co., *Hall & Chandler* 400. Southern California: Little Bear Valley, San Bernardino Mts., *Chandler*.

Refs.—RANUNCULUS FLAMMULA L. Sp. Pl. 548 (1753), type European. Var. *intermedius* and var. *reptans* Gray, Syn. Fl. 1¹:26–27 (1895), as to U. S. Pacific Coast plants. The leaves are very variable in form, even in one collection or on one individual, and the ample Californian material before us must be taken as one thing. *R. intermedius* Heller, Bull. Torr. Club, 25:580 (1898), as to Pacific Coast plants.

R. SAMOLIFOLIUS Greene, Pitt. 3:13 (1896), "higher Sierra Nevada from Mt. Shasta southward." Stems half-reclining, leafy throughout, 1-flowered; leaves entire, oblanceolate, long-petioled, 2 to 4 inches long, the cauline oval or obovoid (ex. char.). This may be nearer R. hydrocharoides Gray than R. flammula L.

6. **R. pusillus** Poir. DWARF SPEARWORT. Slender annual, 3 to 11 inches high; herbage glabrous or the dilated petiole somewhat sparingly villous-ciliate; basal leaves round-ovate to ovate, toothed or entire, 3 to 8 lines long, on elongated petioles; cauline leaves elliptic-oblong to linear-lanceolate, entire or slightly dentieulate, ¾ to 2 inches long, more shortly petioled; flowers minute; sepals subscarious, mostly not reflexed; petals commonly 1 to 3, ¾ line long; achenes numerous in a small globose head, papillate, ½ line long, the beak very minute.

Low wet ground or in shallow pools, North Coast Ranges (Marin Co. to Humboldt Co.). Eastern United States. Apr.-May. Cattle do not eat it.

Locs.—Between Olema and Bolinas, *T. Brandegee;* Sonoma, *R. Kuhn;* Howell Mt., *Tracy* 1531; Calistoga, *Jepson* 9180; Willits, *Davy & Blasdale;* Alder Pt., Eel River, *Davy* 1912.

Refs.—RANUNCULUS PUSILLUS Poir. in Lam. Encyc. 6:99 (1804), type from the Carolinas; Jepson, Fl. W. Mid. Cal. 199 (1901). Var. *lindheimeri* Gray, Proc. Am. Acad. 21:367 (1886); Jepson, Fl. W. Mid. Cal. ed. 2, 170 (1911). *R. trachyspermus* var. *lindheimeri* Engelm. Pl. Lindheim. 1:3 (1845), type loc. Houston, Tex., *Lindheimer. R. biolettii* Greene, Pitt. 2:225 (1892), type loc. Shellville, Sonoma Co., *Bioletti.*

7. **R. glaberrimus** Hook. Perennial; stems 3 to 7 inches high, 1 to 3-flowered, these and the basal leaves from a cluster of slender-fusiform roots; herbage glabrous, somewhat succulent; basal leaves roundish to oval, obtuse or truncate at base, 3-lobed at apex, or entire, ½ to 1¼ inches long, on petioles 3 to 4 times as long; cauline leaves few, 3-lobed or 3-parted, short-petioled or subsessile; flowers golden-yellow, sometimes aging white, ¾ to 1¼ inches broad; achenes plump, with roundish back, ¾ line long, the short beak slender-subulate, straight.

Moist flats: Lassen, Modoc and Siskiyou cos. North to British Columbia and east to Colorado.

Locs.—Milford, Lassen Co., *M. S. Baker;* Alturas, *L. S. Smith* 915; Ft. Bidwell, *Manning* 54; Big Valley, Modoc Co., *M. S. Baker;* Goose Lake, *Austin & Bruce;* Shasta River Cañon, *Butler* 1117.

Refs.—RANUNCULUS GLABERRIMUS Hook. Fl. Bor. Am. 1:12, t. 5, fig. A (1829), Kettle Falls (Columbia River) and Rocky Mts., *Douglas. R. ellipticus* Greene, Pitt. 2:110 (1890). *R. glaberrimus* var. *ellipticus* Greene, Fl. Fr. 298 (1892). *R. austinae* Greene, Erythea, 3:44 (1895), type loc. crevices in high bluffs of lava rock east of Willow Creek Valley 30 miles w. of Goose Lake, *R. M. Austin.*

8. **R. eschscholtzii** Schlecht. Perennial; stems and leaves in a dense tuft on a very short vertical rootstock which bears a fascicle of fibrous or thickened roots; stems erect, 4 to 6 (or 10) inches high; herbage glabrous, the calyx slightly hairy; basal leaves 6 to 15 lines broad, broader than long but roundish or reniform in outline, subcordate at base, unequally 3-cleft or -parted, the smaller central lobe obovate, entire, or 3-toothed, the lateral mostly 3-cleft, rarely all the lobes alike, but all the apices acute; petioles 1 to 2 inches long; cauline leaves few, similar or pedately 3-cleft, short-petioled; pedunеles terminal, naked, ½ to 1 (or 2½) inches long; flowers golden-yellow (often aging dull white), 4 to 9 lines broad; petals round-obovate; achenes thickened, glabrous, smooth, somewhat carinate on the back, the beak short, recurved; receptacle oblong, 4 to 5 lines long.

Subalpine, in gravelly or rocky surface streamlets on cool mountain slopes, 9000 to 13,700 feet; central and southern Sierra Nevada from Nevada Co. to Tulare Co.; White Mts.; San Bernardino and San Jacinto mountains. Western Nevada. North to Alaska.

Geog. Note.—This species is apparently absent from the northern Sierra Nevada, Mt. Shasta, the Coast Ranges and the Oregon Cascades. The plants of the high Sierras are, in habit, foliage and flowers, at one with Oregon plants distributed as R. eschscholtzii Schlecht. by many capable botanists and so described in local floras. The achenes of the California plants are turgid when well-developed, certainly not "compressed," although sometimes slightly carinate, but often no more so than in northern specimens. At best this single character, so slight and

variable, could be of no more than varietal value. If specimens from Iliuliuk, Unalaska, Aleutian Islands (*Jepson* 67), were mixed with specimens from Mt. Lyell, we feel certain that they could not afterwards be segregated into their respective collections. The styles are quite alike in the two and even the faintly tawny shade of the hairs on the upper reduced leaf-sheaths is the same. The peduncles vary in length but they are often as short as in Alaskan specimens. Therefore we quote here: Piute Mt., Yosemite Park, *Jepson* 4579; Vogelsang Pass, *Jepson* 3226; Mt. Lyell, *Hall & Babcock* 3651; Mt. San Jacinto, *Hall* 2414. The thicker-leaved plants (var. **oxynotus** Jepson n. comb.) may be listed as follows: Mt. Stanford, Nevada Co., *Sonne;* Stanislaus Peak, *A. L. Grant* 535; Sonora Peak, *A. L. Grant* 401; Kaiser Peak, Fresno Co., *A. L. Grant* 1427; Kearsarge Pinnacles, *Jepson* 850; Mt. Whitney, *Jepson* 1077; Army Pass, *Jepson* 5062; Milestone Creek, upper Kern River, *Jepson* 5033; Alta Mdws., *Hopping* 515; Lost Creek, Sawtooth Range, *Jepson* 4995; Farewell Gap, *Jepson* 1025; Olancha Mt., *Hall & Babcock* 5232; White Mountain Peak, *Jepson* 7384; Mt. San Gorgonio, *Blasdale.*

Refs.—RANUNCULUS ESCHSCHOLTZII Schlecht. Animad. Ran. 2:16, t. 1 (1820), type from the Aleutian Islands, *Chamisso.* Var. OXYNOTUS Jepson. *R. oxynotus* Gray, Proc. Am. Acad. 10:68 (1874), type loc. Castle Peak, Nevada Co., *Lemmon.*

9. **R. sceleratus** L. CURSED CROWFOOT. Annual; stems erect, somewhat fistulous, branching, leafy, 7 to 12 inches high, from a cluster of stout fibrous roots; herbage glabrous or nearly so, somewhat succulent; leaves ¾ to 1½ inches broad, parted into 3 (or 5) cuneate segments which are again cleft and coarsely toothed, the ultimate lobes or divisions short-oblong, obtuse; basal leaves long-petioled; uppermost leaves nearly sessile, the segments broadly linear and nearly entire; flowers 3 to 5 lines broad; petals pale yellow, scarcely exceeding the calyx; receptacle elliptic or oblong, 1½ to 4 lines long; achenes thick, ½ line long, the beak almost none.

Shallow pools or muddy margins of lakes of the interior plateau from Oregon to Arizona (thence far northward and eastward), entering California in Modoc Co. Juice acrid, raising blisters on the skin.

Locs.—Pitt River below Goose Lake, *R. M. Austin.* Klamath Falls, Ore., *R. M. Austin.*

Refs.—RANUNCULUS SCELERATUS L. Sp. Pl. 551 (1753), type European. *R. eremogenes* Greene, Erythea, 4:121 (1896), type loc. "West American desert regions."

10. **R. bongardii** Greene. Perennial; stems slender, or often coarse, 1 to 2 feet high; herbage sparsely or densely pilose below, above pubescent or hir-sutulose; leaves 3-parted, the divisions shallowly 3-cleft or disposed to be quite entire, rather broad and elongated, especially the upper; flowers small (2 to 3 lines broad), very pale yellow or whitish; achenes elliptic, glabrous, the very slender beak as long as the body, erect-curved like a grab-hook.

Shady woods: Humboldt Co. and northern Sierra Nevada. North to Alaska.

Locs.—Eureka, *Tracy* 1104, 3133; Donner Lake, *Sonne.* Var. **greenei** Piper. Achenes hispidulose.—Kneeland Prairie, Humboldt Co., *Chesnut & Drew;* Eureka, *Tracy* 1137, 2416, 4687; Pine Ridge, Fresno Co., *Hall & Chandler* 131; Little Bear Valley, San Bernardino Mts., *Chandler.*

Refs.—RANUNCULUS BONGARDII Greene, Erythea, 3:54 (1895). *R. tenellus* Nutt.; T. & G. Fl. 1:23 (1838), type loc. Columbia and Willamette rivers, *Nuttall;* not R. tenellus Viviani, Pl. Aegypt. (1831). Var. GREENEI Piper, Contrib. U. S. Nat. Herb. 11:275 (1906). *R. greenei* Howell, Fl. Nw. Am. 1:18 (1897). *R. tenellus* var. *lyallii* Rob. in Gray, Syn. Fl. 1²:33 (1895). *R. occidentalis* var. *lyallii* Gray, Proc. Am. Acad. 21:373 (1886), type loc. Pen d'Oreille River, Ida., *Lyall;* not R. lyallii Hook.

11. **R. canus** Benth. Perennial; stems erect, branching, 1 to 1¾ feet high; herbage fragrant (at least at certain stations, probably not always), soft-villous all over when young or the leaves beneath conspicuously silky-lanate; leaves mostly in a basal tuft, deeply parted and subdivided into many lanceolate acute segments, long-petioled; flowers 6 to 12 lines broad; petals 5 to 8 (or 10); achenes large, flat, glabrous, 2 to 3 lines long, including the rather conspicuous triangular-subulate beak which is slightly curved at the tip.

Plains or low rolling hills: Sacramento Valley south to Contra Costa Co. It passes into R. californicus.

Locs.—Antioch, *Davy* 925; Montezuma Hills, *Plott;* Vanden, Vacaville and Violet, Solano Co., *Jepson* (hardly at all silky); Sweeney Creek, *Jepson* 8254; nw. Solano Co., *Jepson* (dorsal keel of achenes hispidulose); Cannon, *Jepson* 6782; Chico, acc. *Gray.* The var. BLANKINSHIPII Rob. (achenes hispidulose) occurs on the low foothills of western Yolo Co. and western Solano Co.

Refs.—RANUNCULUS CANUS Benth. Pl. Hartw. 294 (1848), type loc. moist valley fields, Butte Co.; Gray, Proc. Am. Acad. 21:374 (1886). The type is *Hartweg* 1626. This number in the Herbarium Benthamianum (Kew) is remarkably silky and we have seen nothing quite like it; but the same number in the Herbarium Hookerianum (Kew) is less hairy and is well matched by the specimens from the Montezuma Hills cited above, which, in turn, grade into plants from other stations. The soft white pubescence is most marked on the early growth. *R. californicus* var. *canus* Brew. & Wats. Bot. Cal. 1:8 (1876). *R. hesperoxys* Greene, Erythea, 2:189 (1894), based on spms. from Antioch and Chico. *R. canus* var. *hesperoxys* Davis, Minn. Bot. Stud. 2:475 (1900); Jepson, Fl. W. Mid. Cal. 200 (1901). Var. BLANKINSHIPII Rob.; Gray, Syn. Fl. 1¹:35 (1895), type loc. Capay, *J. W. Blankinship.* *R. blankinshipii* Heller, Muhl. 1:40 (1904).

12. **R. californicus** Benth. CALIFORNIA BUTTERCUP. Stems mostly caespitose, arising from a cluster of stout fibrous perennial roots, erect or ascending, 9 to 18 inches high, freely branching and many-flowered; herbage hirsute (especially below) to nearly glabrous, the leaves often silky beneath; leaves ovate or roundish in outline, 1 to 2 (or 3) inches long, ternately divided, and again divided, parted or lobed, the earlier with the broad divisions shallowly and mostly obtusely lobed, the later with the laciniately and sharply cleft divisions less broad or narrowly linear; flowers 6 to 11 lines broad; sepals usually somewhat petal-like, closely reflexed; petals 9 to 16, uncommonly as few as 7 or 8, obovate to oblong; achenes glabrous, strongly flattened, nearly as broad as long, ¾ to 1½ lines long, very rounded dorsally, the ventral side straightish; beak very short, mostly stoutish and closely recurved, sometimes slender and slightly recurving.

Open hills and moist valleys, our most common species, abundant in the Coast Ranges and south to Southern California. Also occuring in the Great Valley and neighboring foothills but localized or less common.

Geog. Note.—The exact, that is detailed geographic limits of this species have not been well worked out and are perhaps not susceptible of sharp topographic definition on account of merging with its varieties and with R. canus and possibly with R. occidentalis. We have never, however, observed a multipetalous buttercup in the Sierra Nevada proper; on the other hand Ranunculus californicus is frequent everywhere in central California and often dominant, coloring leagues upon leagues of grassy hills in the late winter and early spring with its profusion of yellow flowers. We take as typical, for purposes of our diagnosis, the prevailing plant of the central coast hills bearing flowers with many petals. Its small earliest leaves are shallowly 3-lobed, but otherwise entire or sparingly toothed. These are followed by deeply 3-parted leaves, the broad segments again 3-lobed or -cleft, or laciniate-toothed. The larger later leaves are similar, but usually cut up into narrower or linear segments.

The multipetalous R. californicus and the 5-petaled R. occidentalis are so similar in habit, in flower structure and even occasionally in number of petals, and both are so variable as to the beak character of their achenes and as to pubescence, that they cannot in extreme forms be separated except by an arbitrary cleavage. The most highly developed type of each, however, is a distinct unit, and this extreme type represents in each case a wide-spread dominant in exclusive territory. By reason of this consideration and on account of a series of named variants centering around each type, it seems wholly desirable to retain these two as species. The achenes of R. californicus are roundish and very flat, with a stout and very short style, the tip of which is bent backward in such a way as to leave little space between it and the body of the achene. This type of style is, however, not constant, since slender nearly erect styles in one direction and broad styles in the other direction give a considerable range of variation. On the other hand, while the achenes of R. occidentalis are essentially similar to R. californicus, the beak of the achene in R. occidentalis, in its most characteristic form, projects forward, or if recurving lies forward of the median longitudinal line of the achene. This feature is, however, usually not true of its varieties. In the Sierra foothills the var. eisenii exhibits within narrow geographic limits certain beak forms resembling those of R. californicus and other forms which intergrade continuously to R. occidentalis. The narrow-beaked type of achene of R. californicus, therefore, passes by intergrades into those of R. occidentalis, just as the

broad-beaked forms of R. californicus undoubtedly pass by continuous intergrades into R. cauus. The variability of the achene in this group is therefore in certain respects so considerable that no decisive test can be had from it. So far as the achene character is concerned, var. eisenii of R. occidentalis might be transferred to R. californicus. On the other hand the petal number in var. eisenii indicates definite genetic connection with R. occidentalis. The most dependable character for the segregation of these forms seems to lie in number of corolla parts. The petals of R. californicus vary most commonly from 7 to 16 and we determined the modal value to be 12 which if graphically represented makes a 2-sided figure. The petals of R. occidentalis are 5, varying to 7 or 8, the modal value being 5 and representing a 1-sided figure. This seems to be therefore the soundest test of differentiation between these two species.

Locs.—The following collections are fairly typical of R. californicus: hills west of St. Helena, *Jepson;* Olema, *Jepson;* Berkeley, *Jepson* (compared by us with the type at Kew); San Francisco, *Harriet Walker;* Livermore, *Bioletti;* Mt. Hamilton, *Jepson* 4235; Monterey, *Heller* 6530; San Luis Obispo, *Summers;* Los Angeles, *Braunton* 814; San Bernardino, *Parish.*

Teratology.—A "green-flowered" (teratological) buttercup, usually growing on the blue or most viscous adobe, occurs in abundance and with considerable variety of form on the hills east of Walnut Creek, Contra Costa Co. It occurs likewise in Conn Valley, Napa Co., and also grows freely in San Mateo Co. near Redwood and on the hills of southern Santa Clara Co. Modification affects conspicuously the petaline and sepaline whorls which are more or less virescent or frondescent. Within a few square yards one may commonly find petaline organs varying from normal yellow through greenish yellow to wholly virescent or frondescent. The extreme virescent petaline structures are commonly elliptic to oblong, 2 to 3 (or 4) lines long, and borne on slender claws as long or half as long. This form is noted here principally on account of its frequence.

Var. **cuneatus** Greene. Stems prostrate or decumbent; leaves thin; the lower leaves sharply cleft into 3 broad lobes, the divisions incised but more equally toothed than in the species, so that the outline is rounded-subcordate.—San Mateo to San Francisco and Marin Co.; often on ocean bluffs.

Var. **crassifolius** Greene. Stout, low, the stems assurgent; herbage somewhat succulent, sparingly villous; basal leaves shallowly 3-lobed, the lobes rounded and more or less coarsely toothed; cauline leaves parted into 3 oblong lobes.—Coast bluffs, Mendocino Co. to San Francisco.

Var. **ludovicianus** Davis. Stems many, coarse, rather densely tufted; herbage rather densely pilose or even silky, especially below; leaves cut into rather broad acuminate or lanceolate segments; flowers and achenes of the species.—Mountain meadows, Tehachapi Mts. to the San Bernardino Mts. and San Diego Co., 4500 to 7000 feet.

Locs.—Tehachapi, *Davy* 2164; San Bernardino Mts. (Fawnskin, *Chandler,* Bear Valley, *Parish* 3691); Palomar, *Jepson;* Santa Ysabel, *Jepson* 8523.

Refs.—Ranunculus californicus Benth. Pl. Hartw. 295 (1848), type loc. Monterey, *Hartweg* 1628; Jepson, Fl. W. Mid. Cal. 200 (1901). The first three varieties named below appear to be ecological: Var. *latilobus* Gray, Proc. Am. Acad. 21:375 (1886), leaves like the species but with broad divisions, a form of the South Coast Ranges and Southern California, at low altitudes. Var. *laetus* Greene, Fl. Fr. 299 (1892), stoutish and fistulous with broad leaf segments.—San Francisco Bay region, borders of marsh lands. Var. *canescens* Greene l.c., basal parts long-villous; flowers large (ex. char.).—Mt. Diablo Range. The three following varieties seem more stable: Var. cuneatus Greene l.c., type loc. San Mateo Co. Var. crassifolius Greene, Erythea, 1:125 (1893), type loc. Ft. Bragg, *C. E. Michener.* Var. ludovicianus Davis, Minn. Bot. Stud. 476 (1900). *R. ludovicianus* Greene, Bull. Cal. Acad. 2:58 (1886), type loc. Tehachapi Pass, *Curran;* Erythea, 4:65 (1896).

13. **R. occidentalis** Nutt. Perennial; habit of R. californicus; herbage pilose or hirsute below with spreading hairs, often densely so on the petioles, or varying to nearly glabrous; basal leaves of roundish outline, ¾ to 2 inches broad, incisely 3 (or 5) -cleft or -parted, rarely divided into separate leaflets, the segments mostly broad, shallowly but incisely lobed and toothed; upper cauline leaves divided into linear segments; flower 6 to 10 lines broad; petals 5; achenes flattened, obliquely rounded dorsally, nearly straight on the ventral side, 1 to 2 lines long, the subulate beak saliently erect, straight or somewhat falcate, and commonly projecting somewhat forward rather than recurving, ⅓ to ⅔ as long as the body.

Washington and Oregon. Entering the northern borders of California and occurring mainly as intergrades to the var. eisenii.

Tax. Note.—In the best natural type of the species the beak, whether straight or curving, is disposed to project forward and stand saliently above the ventral angle of the achene, rather than to recurve over the body of the achene. Plants from Siskiyou Co. and southerly to Mendocino Co. and Placer Co. are referred to the species, being the nearest typical of anything found in California: Sherwood Valley, *Davy* 5124; Eureka, *Tracy* 826; Van Duzen River valley opp. Buck Mt., *Tracy* 2689; Placer Co., *Carpenter*.

Var. **eisenii** Gray. Stems slender, erect, 1 to 1½ feet high; stems and leaves pilose with spreading hairs or only the leaves pilose, or the herbage subglabrous; leaves lobed as in the species; flowers 5 to 8 lines broad; petals commonly 5, sometimes 6, rarely 7; beak of the achenes slender, curving, rarely closely recurved.—This is the most widely spread representative of the species in California. It prevails in the Sierra Nevada foothills up to 2500 or 4500 feet and is the common buttercup of openly wooded ridges, flats and valleys. It continues around the foothills of the upper Sacramento Valley and occurs in the inner and middle Coast Ranges, at least as far south as Santa Clara Co. It has commonly a more slender and less strongly recurving beak than in typical R. californicus, but this kind of a beak may often be found in that species. For example, the achenes in specimens of var. eisenii from Los Gatos (*Heller* 7343) match those of R. californicus (of typical habit and multi-petaled) from Mt. Hamilton (*Jepson* 4235). Conversely, the usual form of achene of R. californicus may sometimes occur in var. eisenii, as in specimens from Hetch-Hetchy (*Jepson* 3447). All of which goes to show the weakness of the achene (and especially the beak) character in this section.

Var. **rattanii** Gray. Stems slender, 1 to 2 feet high; pubescence as in var. eisenii; petals 5 or 6; achenes hispidulose, the beak slender, nearly erect or projecting forward a little, or recurved.—Mendocino and Humboldt cos.; north to southern Oregon. Ranges south into Napa Co. in a modified form.

Locs.—Ukiah, *Purdy;* Ft. Seward Ranch ridge, *Jepson* 1895; Alder Pt., *Tracy* 1908; Eureka, *Tracy* 1107½. Grants Pass, Ore., *Howell* (beak slender, nearly as long as the achene).

Series of specimens from the Napa Range (hills east of St. Helena, *Jepson*) show achenes with very variable beaks, sometimes looking towards typical var. rattanii, sometimes exactly typical of R. californicus. The plants grow in closest association with R. occidentalis var. eisenii. Indeed, the two are often collected with roots intertwined and distributed by collectors in the same sheet as if one, which, indeed, they are in nearly all features except the hispidulose achenes. Hispidulose achenes, it may be added, are likely to break out anywhere in the R. californicus-canus-occidentalis series.

Locs.—Sierra Nevada: Limekiln Creek, Tulare Co., *Jepson* 2794; Hetch-Hetchy, *Jepson* 3447; Bear Valley, Nevada Co., *Jepson;* Hat Creek, e. Shasta Co., *Hall & Babcock* 4263. Coast Ranges: Shackelford Cañon, w. Siskiyou Co., *Jepson* 2814; Calistoga, *Jepson;* hills east of St. Helena, *Jepson;* Santa Cruz Mts.

Var. **alceus** Jepson n. comb. Plants diffuse, 6 to 9 (or 15) inches high; stems and petioles very pilose below; flowers small; achenes as in var. eisenii.—Higher altitudes in the north Coast Ranges and Sierra Nevada, (3000 or) 5000 to 7500 feet; a late flowering rather small plant about intermediate between the species and var. eisenii.

Locs.—North Coast Ranges: Elk Mt., *Jepson;* Snow Mt., *T. Brandegee;* Knoxville Ridge, ne. Napa Co., *Jepson* 9044. The following Sierra Nevada specimens are essentially alike and almost if not quite identic with the typical inner North Coast Range plants, the only difference residing in the elongated entire upper leaves or broad leaf divisions of the former: Belle Mdw., Tuolumne Co., *Jepson* 6487; Deadman Creek, Tuolumne Co., *Jepson* 6551; Silver Lake, *Hansen;* Deer Park, *Fox;* Warner Valley, Plumas Co., *Jepson* 4068.

Refs.—RANUNCULUS OCCIDENTALIS Nutt.; T. & G. Fl. 1:22 (1838), type loc. Columbia River plains, *Nuttall*. Var. EISENII Gray, Proc. Am. Acad. 21:373 (1886), type loc. middle Sierra Nevada. Apparently also *R. eisenii* Kell. Proc. Cal. Acad. 7:115 (1876), indefinitely described and the type and type locality not indicated. *R. longilobus* Heller, Muhl. 2:36 (1905), type loc. Middle Creek Sta., near Keswick, *Heller* 7912, is an intergrade from R. occidentalis but nearer var. eisenii. Var. RATTANII Gray, Proc. Am. Acad. 21:373 (1886), type loc. Klamath River, *Rattan;* Jepson, Fl. W. Mid. Cal. 201 (1901). Var. ALCEUS Jepson. *R. alceus* Greene, Erythea, 3:69 (1895), type loc. Elk Mt., Lake Co., *Jepson*.

R. RUGULOSUS Greene, Pitt. 2:58 (1890), type loc. Chowchilla Mts., *F. P. McLean*, stems decumbent; achenes rarely 1 line long, the sides rugose (ex char.).—Perhaps nearest R. occidentalis var. eisenii.

14. **R. repens** L. CREEPING CROWFOOT. (Fig. 107.) Perennial; stems trailing, arising from a cluster of stout fibrous roots, ½ to 1 foot long, rooting at the lower nodes; herbage sparsely bristly, often densely so on the petioles; leaves 1 to 4 inches broad, the basal long-petioled, composed of 3 distinct or nearly distinct leaflets; leaflets incisely 3-parted and again incisely cleft or toothed;

flowers 6 to 12 lines broad; sepals not reflexed; petals much longer than the sepals, brilliant gold; achenes flattened, keel-margined all around, 1 line long, bearing a short stout somewhat curved beak which is bent or hooked at tip.

European species, sparingly naturalized in marshes along the north coast.

Locs.—Berkeley, *Jepson* 9197 (in lawns), 8323a; Bear Valley, Marin Co., *Jepson* 8292 (= var. villosus Lamotte, the hairs wide-spreading); Humboldt Bay.

Refs.—RANUNCULUS REPENS L. Sp. Pl. 554 (1753), type European; Fern. Rhod. 21:169 (1919).

15. **R. macounii** Britt. Perennial; stems stoutish, trailing or reclining, rarely rooting at the nodes, 1 to 1½ feet long; general aspect similar to R. orthorhynchus; stems and petioles hispidly hirsute with spreading hairs; leaves 3-foliolate, incisely 3-cleft, with laciniate and sharply toothed segments; flowers relatively insignificant (4 to 5 lines broad); petals little surpassing the early deciduous sepals; heads of achenes large, dense, globular or somewhat oval; achenes somewhat flattened, carinate-margined all around, 1 to 1½ lines long, with a short-lanceolate straightish beak ½ line long.

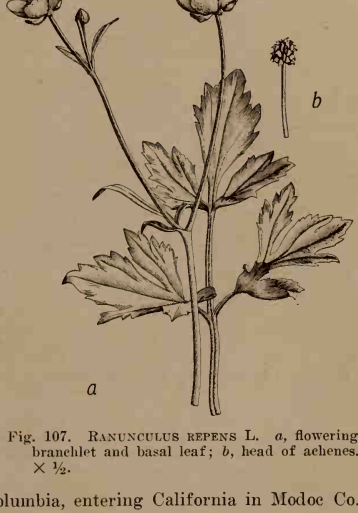

Fig. 107. RANUNCULUS REPENS L. *a*, flowering branchlet and basal leaf; *b*, head of achenes. × ½.

Nevada to Oregon and British Columbia, entering California in Modoc Co. East to the Atlantic.

Locs.—Devils Garden, Goose Lake, *Austin & Bruce.* Truckee Valley, w. Nev., *Doten.*

Refs.—RANUNCULUS MACOUNII Britt. Trans. N. Y. Acad. Sci. 12:3 (1892). *R. hispidus* Hook. Fl. Bor. Am. 1:19 (1829), type loc. British America.

16. **R. bloomeri** Wats. (Fig. 108.) Stems erect or ascending, 5 to 18 inches high, from a cluster of thick-fibrous or even slender-fusiform perennial roots; herbage somewhat succulent, glabrous or a little hairy, especially on the leaf bases; basal leaves 3 foliolate (or a few simple), on petioles 6 to 14 inches long; leaflets (as well as the simple blades) ovate to roundish, obtuse to cordate at base, coarsely dentate, sparsely incised, or 3-lobed, usually petiolulate, ¾ to 2 inches long; flowers few and large, 1 to 1½ inches broad; petals 5, emarginate at apex, the greenish area at base conspicuous and the nectar-gland large; achenes turgid, 1½ lines long, tipped with a slender subulate beak as long.

Low fields near the coast from San Mateo Co. to Contra Costa and Mendocino cos. Feb.-Apr.

Locs.—San Mateo. *Eastwood;* Hillsboro, *Inez Smith;* Mission Hills, San Francisco, *T. Brandegee;* Oakland, *Drew;* Happy Valley, Contra Costa Co., *Gardner;* Olema, *Jepson* 4040; Rutherford, *Jepson;* Calistoga, *C. F. Baker* 1995; Healdsburg, *Alice King;* Long Valley, *Bolander* 4729.

Refs.—RANUNCULUS BLOOMERI Wats. Bot. Cal. 2:426 (1880), type loc. near San Francisco, *H. G. Bloomer;* Jepson, Fl. W. Mid. Cal. 200 (1901).

17. **R. orthorhynchus** Hook. Stems leafy, ascending or erect, ¾ to 1½ feet high, these and the basal leaves from a large cluster of stout-fibrous or slender-fusiform perennial roots; petioles and stems hirsute or villous with spreading hairs; leaves pinnately 5-foliolate, the 3 upper leaflets often approximate; leaflets incisely cleft or toothed, or 3-parted, especially the terminal one, ¾ to 1½ inches long; flowers yellow, 6 to 9 lines broad; petals 5; achene glabrous, thickish, 2 lines long, with a broad ventral channel and weak dorsal keel, the subulate upright beak quite as long as the body.

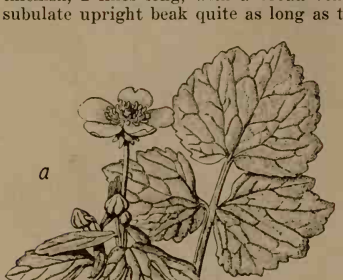

Fig. 108. RANUNCULUS BLOOMERI Wats. *a*, flowering branchlet; *b*, blade of basal leaf. × ⅔.

Wet meadows, middle altitudes (3600 to 5600 feet) in the Sierra Nevada, from Mariposa Co. north to Modoc Co., thence west to Siskiyou Co. Far north to British Columbia.

Locs.—Hog Ranch Road, Yosemite Park, *Hall* 8903; Yosemite Valley, *Congdon;* Holtzel Mdw., Mariposa Co., *Congdon;* Confidence, Tuolumne Co., *Jepson* 7705 (leaflets mostly 3); Belle Mdw., Tuolumne Co., *Jepson* 6483; Placer Co., *Hardy;* Bear Valley, Nevada Co., *Jepson;* Hot Springs Valley, Lassen Peak, *Jepson* 4087; Morgan, c. Tehama Co., *Hall & Babcock* 4378; Bear Flat, nc. Shasta Co., *Hall & Babcock* 4157; Modoc Co., *M. S. Baker;* Sisson, *Hall & Babcock* 4066.

Var. **hallii** Jepson n. var. Leaflets of basal leaves broader than long, with mostly shallow lobes and obtuse teeth.—(Foliorum inferiorum foliolata latiora quam longa, lobis vulgo non profunde et dentibus vulgo obtusis.)—Pine Ridge, Fresno Co., *Hall & Chandler* 236 (type). The achenes are rather sharply margined, these margins running out onto the stout beak as sharp salient ridges. The leaflets are suggestive of those of Apium graveolens.

Var. **platyphyllus** Gray. Stems very stout, (½ or) 1½ to 3½ feet high, from a cluster of slender fusiform roots; herbage brownish-hirsute or pilose, the hairs often retrorse and often dense on the petioles, or nearly glabrous throughout; leaves 3-foliolate (or the cauline ternately divided), the basal long-petioled; leaflets 1 to 2 (or 4) inches long, mostly broad, 3-parted or laciniately or sharply cleft and toothed, or with all or, more commonly, only the terminal leaflet replaced by 3 leaflets; lateral leaflets sessile or short-petiolulate, the terminal one long-petiolulate; flowers ¾ to 1¼ inches broad; petals 5 to 8, round-obovate to broadly oblong, deep rich glistening yellow; achenes margined.—Swamps and ditches: North Coast Ranges, mostly near the coast. North to Washington. Mar.-May.

Locs.—Berkeley, *Greene;* Millwood, Marin Co., *Eastwood;* Pt. Reyes, *Davy* 6723; Calistoga, *Jepson* 9176; Mendocino Co. (Sherwood Valley, *Davy* 5122, Rowe's Sta., *Chandler* 1054, Round Valley, *Westerman*); Humboldt Co. (Arcata, *Chandler* 1110, Pilot Creek, *Chesnut & Drew,* Elk River Valley, *Tracy* 2574).

Refs.—RANUNCULUS ORTHORHYNCHUS Hook. Fl. Bor. Am. 1:21, t. 9 (1829), type loc. Northwest America, *Douglas.* Var. HALLII Jepson. Var. PLATYPHYLLUS Gray, Proc. Am. Acad. 21:377 (1886), based on spms. from the Great Basin region to the Pacific Coast; K. Brandegee, Zoe 4:83 (1893). *R. platyphyllus* Nelson, Bot. Gaz. 42:52 (1906); Piper, Contrib. U. S. Nat. Herb. 11:276 (1906). *R. macranthus* Brew. & Wats. Bot. Cal. 1:8 (1876), not Scheele. *R. maximus* Greene, Bull. Torr. Club, 14:118 (1887), based on San Francisco Bay region spms.

18. **R. marmorarius** Jepson & Tracy n. sp. Stems ascending, 6 to 10 inches high, from perennial roots; herbage sparsely hirsute; basal leaves 3-foliolate, the leaflets cuneate-obovate, 3-cleft into narrow lobes, otherwise entire; cauline leaves deeply 3-parted, or 3-foliolate with lanceolate entire petiolulate leaflets, or simple and lanceolate; achenes with very slender beak as long as or longer than the body.—(Perennis; caules ascendentes, 6–10 poll. alti, sparse hirsuti; folia basalia 3-foliolata; foliola cuneato-obovata, 3-fida, lobis angustis, alioqui integris;

folia caulina profunde 3-fid, vel 3-foliolata foliolatis lanceolatis integris, vel simplex et lanceolata; carpella tenuissima, rostris aequalibus vel longioribus.)

Marble Mt., western Siskiyou Co., *Chandler* (type).

19. **R. hebecarpus** H. & A. Slender delicate annual herb, 5 to 12 inches high, branching, sparsely villous; leaves thin, round or reniform in outline, 3-parted or -divided, the divisions somewhat divergent, entire, notched or lobed, or the uppermost divided into 3 narrowly oblong acute segments; peduncles 3 to 9 lines long; flowers minute, pale yellow; petals early deciduous, commonly before the stamens; achenes few, hispidulous with hooked hairs, orbicular, flat, 1 line long, tipped with a short curved beak.

Common in the foothills and sometimes in the valleys, in the shade of oak and other trees: frequent in the Coast Ranges; Sacramento Valley; Sierra Nevada; Southern California near the coast. South into Lower California, north to Washington.

Locs.—San Diego, *W. S. Wright* 136; Santa Catalina Isl. (Zoe, 1:131); Garvanza, Los Angeles Co., *Greata;* Ft. Tejon, *Davy* 2338; Los Gatos, *Heller* 7302; Ross Valley, Marin Co., *Jepson;* Araquipa Hills, Solano Co., *Jepson;* Scotts Valley, Lake Co., *Tracy* 1703; Capay, Yolo Co., *Blankinship;* College City, *Alice King;* Yreka, *Butler;* Modoc Co., *R. M. Austin;* Auburn, *Bolander* 4510; Angels Camp, *Davy* 1475.

Refs.—Ranunculus hebecarpus H. & A. Bot. Beech. 316 (1840), type from California, *Douglas;* Jepson, Fl. W. Mid. Cal. 201 (1901). Var. *pusillus* Brew. Bot. Cal. 1:9 (1876), 2:426 (1880), a depauperate form.

20. **R. muricatus** L. Annual; stems stout, 3 to 10 inches high; herbage yellowish green, somewhat succulent, glabrous; leaves roundish or reniform, ¾ to 2 inches broad, coarsely toothed and commonly 3-cleft; flowers 3 to 7 lines broad; petals 5 (or 3); achenes 4 lines long, including the stout ensiform beak, the sides very flat, surrounded by a conspicuous raised smooth border and coarsely muricate or prickly.

Low places in valley fields: naturalized from Europe, widely scattered in central and northern California, but not common.

Locs.—Eureka, *Tracy* 3185; Hamilton City, *Hall;* Sonoma Valley, *Jepson* 4189; Angel Isl., *Davy* 6906; San Francisco, *Jepson;* Donner Cañon, Mt. Diablo, *Jepson* 7593; Milpitas, *R. J. Smith;* Saratoga (Zoe, 2:128); Knights Ferry, *F. W. Bancroft;* Quartz, Tuolumne Co., *A. L. Grant;* New York Ravine, El Dorado Co., *K. Brandegee.*

Refs.—Ranunculus muricatus L. Sp. Pl. 555 (1753), type European; Jepson, Fl. W. Mid. Cal. 201 (1901).

21. **R. arvensis** L. Hunger-weed. Erect annual, 1 to 1½ feet high; lower leaves with three broad coarsely crenate lobes, the upper 2 or 3 times divided into narrow acute segments; achenes spiny-tuberculate on the raised margin as well as on the sides.

Introduced from Europe. Mariposa Co.

Loc.—Mt. Bullion, *S. J. Johns,* in 1915; seed sent from Potter Valley in 1919 through P. B. Kennedy.

Ref.—Ranunculus arvensis L. Sp. Pl. 555 (1753), type European.

22. **R. andersonii** Gray. Perennial with the scapes and leaves from a stoutish rootstock; herbage glabrous; scapes naked, 4 to 9 inches high, 1-flowered; leaves of rounded outline, palmately twice or thrice dissected into oblong or linear segments; segments acute, 2 to 4 lines long; flowers 12 to 14 lines broad; sepals and petals withering-persistent; sepals round-ovate, purplish-margined; petals rose color or pink, roundish, with short narrow claw and a pocket-like pit near the base of the blade; achenes numerous, strongly utricular, 3 to 4 lines long, the beak very short.

Great Basin region from Oregon to Arizona, entering California in Modoc and Mono cos.

Locs.—Jess Valley, Modoc Co., *L. S. Smith.* Jupiter Mt., Malheur Co., Ore., *Cusick* 2371;

Gold Mt., Nev., *Purpus* 5991; Karshaw, Meadow Valley Wash, Nev., *Gooding* 630; Virgin Mts., Ariz., *Gooding* 2135.

Refs.—RANUNCULUS ANDERSONII Gray, Proc. Am. Acad. 7:327 (1868), type loc. Blind Springs Mt., Mono Co., *Anderson*. *Oxygraphis andersonii* Freyn, Flora 70:140 (1887). *Beckwithia austinae* Jepson, Erythea, 6:97 (1898). *B. andersonii* Jepson, l.c. 99.

RANUNCULUS JUNIPERINUS Jones is a closely related Utah species, differing from R. andersonii in its whitish petals and non-inflated achenes.

23. **R. cymbalaria** Pursh. DESERT CROWFOOT. Perennial by whip-like or thread-like stolons which root at intervals of 1½ to 2½ inches and produce tufts of leaves and scapes; scapes 1¼ to 8 inches high, 1 to 3-flowered; leaves round-ovate to reniform, cordate at base, remotely notched, 4 to 10 lines long; flowers 4 to 6 lines broad; petals 5 to 9 (or 12), oblong, shorter than or little exceeding the sepals; receptacle oblong-conic, obtuse, 2 to 6 lines high; achenes with striate sides.

Moist alkaline soils in river bottoms or desert lake beds or about desert springs: Southern California to the Mohave Desert and the upper San Joaquin Valley, and north along the eastern side of the Sierra Nevada through Inyo and Lassen cos. to Modoc Co. Widely distributed in North and South America and Asia. May-July.

Locs.—Los Angeles River, *Braunton* 564; Swarthout Cañon, *Hall* 1526; San Bernardino, *Parish;* Barstow, *Jepson* 4796; Bakersfield, *Davy* 1699; Fresno, *Eisen;* Templeton Mt., *Jepson* 4974 (dwarf form); Owens Lake, *Jepson* 5114; White Mts., *Jepson* 7228 (Silver Cañon), 7272 (North Fork Crooked Creek); Beckwith Pass, *Jepson* 7768; Honey Lake Valley, *Davy* 3370; Alturas, *Jepson* 7928; Ft. Bidwell, *Manning* 141.

Refs.—RANUNCULUS CYMBALARIA Pursh, Fl. 392 (1814), type loc. Onondaga, New York; Merritt, Erythea, 4:102 (1896). *Halerpestes cymbalaria* Greene, Pitt. 4:208 (1900). The representation of this species in the Rocky Mt. and Pacific Coast region is set aside by Fernald as var. *saximontanus* (Rhod. 16:162,—1914), but our California material seems seditious towards the proposed segregation.

24. **R. aquatilis** L. WATER BUTTERCUP. Perennial submersed aquatic, only the tips of the slender stems and the flowers resting on the surface of the water; leaves all many times dissected into filiform or capillary divisions, rarely some floating leaves with 3 broad lobes 2 or 3-toothed at apex; flowers 3 to 5 (or 8) lines broad; sepals deciduous; styles subulate, rarely persisting; receptacle often hairy; achenes transversely rugose, commonly hispidulous, about 11 to 18 in a rather compact round head.

Ponds, vernal pools, and slow streams in the valleys and mountains: Coast Ranges; Sierra Nevada; Southern California. It is variable, and being rather common and nearly cosmopolitan, a large number of forms have received specific names. Apr.

Locs.—Coast Ranges: Sisson, *Jepson;* Calistoga, *Jepson;* Oak Knoll, Napa Valley, *Jepson;* Berkeley, *Jepson;* Milpitas, *R. J. Smith*. Sierra Nevada: Modoc Co., *M. S. Baker;* Clover Creek, Genesee Valley, *Jepson* 8023; Bear Valley, Nevada Co., *Jepson;* Hope Valley, North Fork Carson River, *Jepson* 8125; Phoenix Lake, Sonora, *A. L. Grant;* Sequoia (Crockers), *Jepson* 4639; Fish Camp, Mariposa Co., *Jepson* 8395; Volcano Creek, *Jepson* 953. Southern California: Cedar Cañon, San Diego Co., *Forbes*.

Var. **trichophyllus** Gray. GREEN EEL-GRASS. Leaves rather short and rigid, not collapsing on withdrawal from the water.—Widely distributed. Var. **bakeri** Jepson n. comb. Leaves small, sparsely branched, the rigid segments divaricate.—Santa Clara Co. Var. **pedunculatis** Jepson n. comb. Peduncles very stout, falcate-curved, 1 inch long (ex. char.).—Lake Co. Var. **hispidulus** Drew. Lower base of the emersed leaves, and the petioles and stipules hispid.—Humboldt Co.

Refs.—RANUNCULUS AQUATILIS L. Sp. Pl. 556 (1753), type European; Jepson, Fl. W. Mid. Cal. 202 (1901). *Batrachium aquatile* Wimm. Fl. Schles. 8 (1841). Var. TRICHOPHYLLUS Gray, Man. ed. 5, 40 (1867). Var. BAKERI Jepson. *Batrachium bakeri* Greene, Leaflets, 1:95 (1904), type loc. Coast Range hills near Stanford, *C. F. Baker* 786. Var. PEDUNCULARIS Jepson. *Batrachium pedunculare* Greene, l.c., type loc. Lakeport, *C. F. Baker* 3062. Var. HISPSIDULUS Drew, Bull. Torr. Club, 16:150 (1889), type loc. Jarnigan's, Mad River, *Drew*.

25. **R. lobbii** Gray. LOBB'S BUTTERCUP. Annual; submersed leaves none, or when present, few and as in R. aquatilis; floating leaves 6 to 9 lines broad, divergently 3-parted into oblong or ovate lobes, the lateral lobes notched and the middle one commonly entire, or, rarely, all notched; stamens 5 to 10; petals withering persistent; style filiform, about 3 times the length of the ovary; achenes few (4 to 6), rugose, the mature ones commonly with minute black dots.

Whitening the surface of shallow vernal pools: Alameda and Marin cos. to Napa Valley and northern Sonoma. North to British Columbia.

Locs.—Berkeley Hills, *Chandler* 787; betw. Alpine Lake and Fairfax, *Newlon* 97a; Cazadero, *Davy* 1659; Healdsburg, *Alice King;* Calistoga, *Jepson;* St. Helena, *C. F. Baker* 1997.

Refs.—RANUNCULUS LOBBII Gray, Proc. Am. Acad. 21:364 (1886); Jepson, Fl. W. Mid. Cal. 202 (1901). *R. hydrocharis* f. *lobbii* Hiern. Jour. Bot. 9:66, pl. 114 (1871), type from Oregon, *Lobb*. *R. hederaceus* var. Brew. & Wats. Bot. Cal. 1:5 (1876).

14. **KUMLIENIA** Greene.

Glabrous perennial with the leaves and 1-flowered scapes from a fascicle of thickened or fleshy-fibrous roots. Leaves all basal, roundish, shallowly 3-lobed and sparingly toothed, cordate or truncate at base. Sepals 5 or 6, white. Petals 5 or 6, minute, reduced to small yellow stiped nectaries. Achenes sub-follicular, capitate, membranous, lanceolate, attenuate upward into a broadly subulate beak hooked or coiled at the tip, 2 (or 3) -nerved on the sides, at least when dead ripe. Seed fusiform, longitudinally multi-striate.—Species 2, North America. (T. L. Kumlien, one-time Professor of Natural History at Albion College.)

1. **K. hystricula** Greene. Scapes 2 to 9 inches high; leaves roundish in outline but broader than long, ½ to 2½ inches broad, on petioles ¾ to 2 inches long; flowers 5 to 7 (or 12) lines broad; sepals oval; nectaries spoon-shaped, one line long; achenes weakly pubescent, 2 to 2½ lines long; seed ¾ line long.

Clefts of rocks on moist cañon sides, often within reach of flying spray: Sierra Nevada at middle altitudes (1500 to 5000 feet). North to Oregon. Mar.-June.

Tax. Note.—The flowers as seen in their native habitat are delicately engaging and somewhat suggestive of those of Anemone quinquefolia. While individuals are not uncommon in favored spots, specimens are rare in herbaria. Quite dead ripe fruit is seldom collected. Some very mature material from El Dorado Co. is available to us and on examining it we find that the carpels in extreme age split roughly but spontaneously from the base upward along the ventral and dorsal lines into two equal valves, thus releasing the single seed. Were these carpels not capitate, they would, it seems certain, be termed follicles. Our species may belong to the genus Oxygraphis Bunge, but the type of that genus is known to us only from somewhat insufficient descriptions.

Locs.—Bear Creek Cañon, Tulare Co., *Purpus* 1756; Yosemite Falls, *Jepson* 4261; Hetch-Hetchy, *A. L. Grant* 1268; Columbia, *A. L. Grant;* Italian Bar, Stanislaus River, *Jepson* 6369; Dardanelles Cañon, Placer Co., *Bolander* 4630; North Fork American River, *K. Brandegee;* Butte Co., *Austin & Bruce*.

Refs.—KUMLIENIA HYSTRICULA Greene, Bull. Cal. Acad. 1:337 (1886); Pitt. 3:188, pl. 2 (1897). *Ranunculus hystriculus* Gray, Proc. Am. Acad. 7:328 (1868), type spms. from Forest Hill and Newcastle, Placer Co., *Bolander*.

15. **CLEMATIS** L. VIRGIN'S BOWER.

Stems woody below, climbing by aid of the petioles of the opposite compound leaves. Peduncles axillary, bearing 1 to numerous flowers. Flowers (in ours) polygamous. Sepals 4, valvate in the bud, white and petal-like. Petals none (in ours). Stamens numerous. Achenes numerous in a head-like cluster, the styles persistent as hairy or plumose tails, very conspicuous in fruit.—Species about 170, all continents. (Ancient name, from Greek klema, a twig.)

Peduncle bearing a cymose paniele of many flowers, the cymes leafy-bracteate; leaflets 5 to 7; achenes pubescent ..... 1. *C. ligusticifolia.*

Peduncle 1 to 3-flowered, with 2 bractlets below the middle.

Leaflets 3; achenes pubescent ..... 2. *C. lasiantha.*

Leaflets mostly 5 to 9; achenes glabrous ..... 3. *C. pauciflora.*

1. **C. ligusticifolia** Nutt. YERBA DE CHIVATO. Nearly glabrous, except the inflorescence; leaflets 5 to 7, ovate, cordate or obtuse at base, 3-lobed or coarsely toothed about midway, or nearly entire, mostly 1 to 3 inches long; peduncles 1 to 4 inches long, bearing a panicle of many to numerous flowers; flowers ½ to ¾ inch in diameter; sepals narrowly oblong, acute, tomentulose; tails of the achenes 10 to 13 lines long; fruiting panicles corymbose to long-paniculate, 2 to 15 inches long.

Valleys, foothills and mountains: Coast Ranges; Sierra Nevada; Southern California.

Biol. and Economic Note.—It climbs high over shrubs and sometimes ascends trees. In Mill Creek Cañon, San Bernardino Mts., we found the vines festooning alders (Alnus rhombifolia Nutt.) to a height of 50 feet; their trunk "cables" or stringers measured 4 to 12 inches in circumference. An infusion of the herbage is used by Spanish-Californians as a healing wash for barbwire cuts in horses.

Locs.—Coast Ranges: Yreka, *Butler* 1810; Sisson, *Jepson;* Salmon River Forks, *Jepson;* Ukiah, *Purdy;* Vaca Mts., *Jepson;* Green Valley, *Jepson;* Napa Valley, *Jepson* (sepals sometimes 5); Mark West Creek, *Bioletti;* Santa Cruz, *F. P. McLean;* Carmel River, *Jepson;* Cantua Creek, San Carlos Range, *Lillis;* Santa Barbara, *M. S. Baker.* Sierra Nevada: Amador Co., *Hansen;* Hetch-Hetchy, *Jepson* 3426; Erskine Creek, *Purpus* 5627. Desert ranges: Silver Cañon, White Mts., *Jepson* 7411; Hanaupah Cañon, Panamint Mts., *Jepson* 6966. Southern California: Mint Cañon, San Gabriel Mts., *Peirson* 264; Claremont, *C. F. Baker* 3458; San Antonio Cañon, *Peirson* 52; San Bernardino Valley, *Parish;* Mt. San Jacinto, *Hall.* Also on Santa Rosa, Santa Cruz, and Santa Catalina islands (Zoe, 1:131).

Refs.—CLEMATIS LIGUSTICIFOLIA Nutt.; T. & G. Fl. 1:9 (1838), type from "plains of the Rocky Mts.," *Nuttall;* Jepson, Fl. W. Mid. Cal. 198 (1901). Var. *californica* Wats. Bot. Cal. 1:3 (1876).

2. **C. lasiantha** Nutt. PIPE-STEM. Branchlets and sepals tomentose-pubescent, the foliage less so; leaves trifoliolate, the leaflets elliptic to orbicular, truncate or rounded at base, coarsely toothed and often 3-lobed, 1 to 2 inches long; peduncles 1 (rarely 3) -flowered, 2 to 6 inches long; flowers 1¼ to 2¼ inches in diameter; sepals broadly oblong, usually obtuse; achenes supporting a tail 1 to 1½ inches long; the fruit of one flower forming a head-like cluster 2 to 2½ inches broad.

Cañons of the Coast Ranges, Sierra Nevada, and mountains of Southern California: clambering over shrubs or low trees and often illuminating a hillside with its profusion of flowers. Occasionally along streams in the valleys. Apr.-May.

Locs.—Coast Ranges: New River, Trinity Co., *Jepson;* St. Helena, *Jepson;* Vaca Mts., *Jepson;* Ross Valley, *Bioletti;* Oakland, *Chesnut;* Los Gatos, *Heller* 7269; Santa Lucia Creek above Arroyo Seco, *Jepson;* San Luis Obispo, *Summers.* Sierra Nevada: Butte Co., *R. M. Austin;* Gwin Mine, Calaveras Co., *Jepson;* Rawhide, Tuolumne Co., *A. L. Grant* 660; Middle Fork Kaweah River, *Jepson.* Southern California: Millards Cañon, San Gabriel Mts., *Peirson* 51; Mill Creek, San Bernardino Mts., *Parish;* Cuyamaca, *Hall.*

Refs.—CLEMATIS LASIANTHA Nutt.; T. & G. Fl. 1:9 (1838), type loc. San Diego, *Nuttall;* Torr. Bot. Mex. Bound. 29, pl. 1 (1859); Jepson, Fl. W. Mid. Cal. 197 (1901).

3. **C. pauciflora** Nutt. ROPE VINE. Stems slender; herbage silky-pubescent when young; leaves more or less fascicled, 3 to 5-foliolate or the basal leaflets each replaced by 3 leaflets; leaflets roundish to ovate, toothed and often 3-lobed, often cordate at base, ¼ to 1 inch long; peduncles 1 (or 3)-flowered, ¾ to 1 inch long; flowers ¾ to 1 inch broad; sepals 4 or 3; achenes glabrous, their tails about 1 inch long.

Trailing over rocks or clambering over bushes: cismontane Southern California. Mar.-Apr.

Locs.—San Bernardino, *Parish* 3626; Santa Ana, *Alice King;* San Jacinto, *Gregory;* Winchester, *M. M. Todd;* Menifee, *Alice King;* Carrizo Creek, *T. Brandegee;* San Diego, *Abrams* 3428.

Refs.—CLEMATIS PAUCIFLORA Nutt.; (by error *parviflora*) T. & G. Fl. 1:9 (1838), type loc. San Diego, *Nuttall;* Gray, Syn. Fl. 1¹:5 (1895).

CALYCANTHACEAE. Sweet-shrub Family.

Aromatic shrubs with opposite entire leaves and no stipules. Flowers large, solitary, terminating the branches. Bracts, sepals and petals passing into each other, imbricated in many series, adnate at base to the enlarged hollow receptacle which is like a rose-cup. Stamens numerous, the inner ones sterile. Pistils many, distinct, nearly enclosed in the hollow receptacle, becoming achenes.—Monotypic genus of 6 species, 4 in North America and 2 in Asia.

Bibliog.—Kearney, T. H., Nomenclature of the genus Buettneria Duham. (Bull. Torr. Club 21:173–175,—1894).

1. CALYCANTHUS L.

Flowers livid red. Petals in several rows at mouth of tube, the inner ones shorter. Styles equaling the anthers, filiform, colorless. Seed without endosperm; cotyledons foliaceous, convolute, caulicle inferior. (Greek kalyx, covering or calyx, and anthos, flower.)

1. **C. occidentalis** H. & A. Spice Bush. Sweet Shrub. (Fig. 109.) Erect branching shrub 5 to 9 feet high; leaves ovate to oblong-lanceolate, acute, rounded at base, 1½ to 6 inches long; sepals and petals linear-spatulate, 1¼ inches long or less, the upper ½ or ⅓ fading tawny or brown in age; filaments ⅓ line long; fruiting receptacle cup-like, 1 to 1¼ inches long; achenes oblong-ovate, slightly oblique or curved, a trifle flattened and bordered all around with a granular margin, somewhat velvety-hirsute, 4 to 5 lines long.

Along cañon streams in the North Coast Ranges and Sierra Nevada foothills.

Fig. 109. Calycanthus occidentalis H. & A. *a*, flowering branchlet; *b*, fruiting receptacle. × ½.

Folk Lore.—This shrub has always interested the settlers in the foothills and it has acquired in consequence a variety of common names. It is called "Spice-wood" on Howell Mt., "Wine Flower" in Sonoma Co., "Spice Bush" in Napa Valley, "Wild Poppy" in Trinity Co., where it is reputed poisonous to cattle, and "Vinegar Bush" in the Kaweah region. A crushed flower is sometimes put in a knotted corner of the handkerchief by the hill folk as a perfume.

Locs.—Coast Ranges: Peanut, Trinity Co., *J. W. Patton;* Cloverdale, *Bolander;* Mark West Creek, *Jepson;* Mt. St. Helena, *Jepson;* sw. of Calistoga, *Jepson;* Howell Mt., *Jepson* 1725; Gates Cañon, Vaca Mts., *Jepson* 561; Cazadero, *Blasdale;* Sonoma, *Bioletti.* Sierra Nevada: Morley Sta., Shasta Co., *M. S. Baker;* Table Mt., n. of Oroville, *Heller* 10,782; Merced River near Grouse Creek, *Jepson* 8354; Cedar Creek, Sequoia Park, *Jepson;* South Fork Kaweah River, *Jepson.*

Refs.—Calycanthus occidentalis H. & A. Bot. Beech. 340, t. 84 (1840); Jepson, Fl. W. Mid. Cal. 190 (1901). *Butneria occidentalis* Greene, Erythea 1:207 (1893).

BERBERIDACEAE. Barberry Family.

Shrubs or herbs, ours with alternate compound leaves. Flowers perfect, regular, hypogynous. Sepals 6, in 2 circles. Petals 6, in 2 circles, the stamens as many and opposite them. Anthers opening by an uplifting valve or lid. Ovary one, superior, 1-celled, becoming in fruit a capsule, a berry, or dry and coriaceous. Seeds with endosperm. Achlys is anomalous; it has no perianth

and 9 to 13 stamens.—Genera 8 and species about 140, mostly north temperate zone, only Berberis reaching into the southern hemisphere.

Bibliog.—Lindley, J., Evergreen Barberries cult. in Great Britain (Jour. Lond. Hort. Soc. 5:1-21,—1850). Fedde, F., Versuch einer Monographie der Gatt. Mahonia (Engler, Jahrb. 31:30-133, figs. 1-5,—1901).

Shrubs or low woody plants; leaves pinnate, prickly; petals bifid ..... 1. BERBERIS.
Perennial herbs; leaves all basal, ternate, not prickly.
Calyx and corolla none; leaves with 3 sessile leaflets ..... 2. ACHLYS.
Calyx and corolla present, reflexed; petals entire; petioles once or twice ternately divided, the divisions bearing 3 (rarely 1) petiolulate leaflets ..... 3. VANCOUVERIA.

1. **BERBERIS** L. BARBERRY.

Evergreen shrubs or low suffrutescent plants with yellow wood. Leaves alternate, prickly, in ours pinnately compound with the rachis jointed at the insertion of the leaflets. Flowers yellow, in racemes. Sepals petal-like. Petals concave, in ours distinctly bifid. Filaments irritable. Stigma peltate-umbilicate. Fruit a berry. Species about 110, all continents except Australia. (Arabic name.)

Filaments with a pair of recurved teeth near the apex; racemes short, from small terminal or lateral buds; bud-scales few, deciduous, small (1 to 2 lines long); leaflets 3 to 9, pinnately veined.
Leaflets with comparatively few (mostly 5 to 15) teeth, the teeth strongly spinose; erect shrubs of dry inner ridges or of the desert.
Racemes loosely few-flowered.
Leaflets equal or nearly so; tooth-like lobes of the leaflets coarse, mostly subequal ..... 1. *B. fremontii.*
Terminal leaflet much longer than the lateral ones; terminal lanceolate tooth of each leaflet often entire, many times larger than the small lateral teeth 2. *B. nevinii.*
Racemes densely many-flowered; teeth of the leaflets very coarse ..... 3. *B. californicum.*
Leaflets with more numerous teeth.
Foliage not very dense; leaflets with many teeth.
Low (about ½ to 1 foot high).
Stems erect or ascending; leaflets mostly pale or glaucescent above, mostly glaucous or whitish beneath, their teeth spine-tipped ..... 4. *B. pumila.*
Stems prostrate or ascending; leaflets dull, their teeth bristle-tipped..5. *B. repens.*
Erect, 1 to 3 feet high; leaflets shining above, their teeth spine-tipped ..... 6. *B. aquifolium.*
Foliage mostly forming a dense terminal fascicle; leaflets thin, with numerous small bristle-tipped teeth; coast region ..... 7. *B. pinnata.*
Filaments without teeth; racemes elongated, loose, solitary or few from a terminal bud; bud-scales large (¾ to 1¾ inches long), persistent; leaflets 11 to 21, somewhat palmately veined ..... 8. *B. nervosa.*

1. **B. fremontii** Torr. DESERT BARBERRY. Shrub 5 to 8 (or 15) feet high; leaflets 5, ovate, rigidly coriaceous, yellowish or glaucous, scarcely at all or only moderately undulate, 6 to 12 lines long, strongly and sinuately 5 or 7-lobed, the lobes strongly spinose; petiole articulated near the base or often a supplementary pair of leaflets borne at this point; racemes few (3 to 9)-flowered, 1 to 1¼ inches long, the peduncles as long or almost none; berries at maturity dull brown, somewhat inflated, 5 to 6 lines in diameter.

Mountain slopes: eastern Mohave Desert; Colorado Desert. East into Arizona and southern Nevada, south into Lower California and Sonora. May-June.

Locs.—New York Mts., *Jepson* 5438; Jacumba, *Abrams* 3693.

Refs.—BERBERIS FREMONTII Torr. Bot. Mex. Bound. 30 (1859), type loc. Virgen River, s. Utah, *Fremont. Mahonia fremontii* Fedde in Engler Jahrb. 31:98 (1901). *Odostemon fremontii* Rydb. Bull. Torr. Club 33:141 (1906).

2. **B. nevinii** Gray. Shrub 6 to 8 feet high, with many erect loose branches; leaflets 5, ½ to 1¼ inches long, the lateral oblong, the terminal one broadly lanceolate, acuminate, all with few and small spinose teeth; petioles almost none; racemes loosely 5 to 7-flowered.

Sandy slopes, eastern edge of San Fernando Valley; very closely allied to B. fremontii.

Refs.—BERBERIS NEVINII Gray, Syn. Fl. 1¹:69 (1895), type loc. San Fernando Valley, *Nevin. Mahonia nevinii* Fedde in Engler Jahrb. 31:102 (1901). *Odostemon nevinii* Abrams, Bull. N. Y. Bot. Gard. 6:359 (1910).

3. **B. californicum** Jepson n. sp. Stems rigidly erect, 3 to 6 (or 10) feet high, little branched; leaves 1½ to 4 inches long; leaflets 5 to 9, ovate, 1 to 2 inches long, very pale or glaucescent, strongly reticulate, repandly dentate, the 8 to 12 teeth ending in long stout spines, their length ⅓ to ⅔ the breadth of the body of the blade, the blade so strongly undulate that the spines are presented in nearly all directions; racemes 1 to 2 inches long, the pedicels mostly 3 to 5 lines long.—(Caules erecti, rigidi, 3–6 (vel 10) ped. alti; folia 1½–4 poll. longa, 5–9-foliolata; foliola ovata, 1–2 poll. longa, sub-glauca, per-reticulata, per-undulata, dentibus spinosis; racemi 1–2 poll. longi.)

Dry rocky interior foothills, 300 to 1500 feet or up to 6000 feet on desert ridges: Inner Coast Range, southward to cismontane Southern California; apparently also in southern Sierra Nevada foothills.

Locs.—Pellejo Hills, nw. Solano Co., *Jepson* (type); North Fork Lewis Creek, Priest Valley, *Jepson* 2672; near San Carlos Peak, *Brewer* 787; Rancho Cantua, Cantua Creek, *S. C. Lillis;* East Fork Kaweah River, *Jepson;* Loma Paloma, *Hall* 7083 (spines of leaflets less prominent); Eaton Cañon, San Gabriel Mts., *Peirson* 54; Sheep Creek, San Antonio Mts., *Hall;* Seven Oaks, San Bernardino Mts., *Geo. B. Grant* 4066; Bloomington, San Bernardino Valley, *Parish* 4086; betw. Julian and Cuyamaca (Bull. N. Y. Bot. Gard. 6:360).

Refs.—Berberis californicum Jepson. *Odostemon dictyota* Abrams, Bull, N. Y. Bot. Gard. 6:360 (1910). Probably also *Odostemon fascicularis* Abrams, l.c.

4. **B. pumila** Greene. Stems erect, rigid, 5 to 14 inches high; leaflets 5 (3 to 7), broadly ovate, whitish, glaucescent or dull green, 1¼ to 2¼ inches long, the rather coarse or medium-sized teeth about 10 to 18, spine-tipped; racemes dense, 1 to 1½ inches long; berries blue, small, oblong.

Inner North Coast Range and higher Sierra Nevada foothills; north to southern Oregon; 3000 to 5000 feet.

Locs.—Bartlett Mt., Lake Co., *Curran;* Indian Creek, Siskiyou Mts., *Jepson* 2948; Clover Creek, Shasta Co., *M. S. Baker* 464; Downieville, *Eastwood;* Mt. Zion, Amador Co., *Hansen* 219; Five-mile Creek, Columbia, *A. L. Grant* 634; Belmont Mine, Mariposa Co., *Congdon;* Old Colony Mill, Sequoia Park, *Jepson* 628.

Refs.—Berberis pumila Greene, Pitt. 2:161 (1891), type loc. inner North Coast Range in Lake Co., as near as may be determined. *Mahonia pumila* Fedde in Engler Jahrb. 31:82 (1901).

5. **B. repens** Lindl. Creeping Barberry. Stems ascending from a creeping or stolon-like base, simple, 4 to 6 inches high; leaflets 3 to 5, plane or nearly so, dull above, paler beneath, with many small teeth and weak spines; racemes rather dense, 2 to 2½ inches long; berries blue-glaucous.

Del Norte Co. to Modoc Co., thence south to Inyo Co. North to British Columbia and east to the Rocky Mts.

Locs.—Big Flat, Del Norte Co., *Jepson* 2985; Mt. Eddy, *Copeland* 3810; Edgewood, Siskiyou Co., *J. W. Kisling;* Davis Creek, Modoc Co., *M. S. Baker;* Willow Creek Valley, Modoc Co., *R. M. Austin;* Oak Creek, Inyo Co., *S. W. Austin.*

Refs.—Berberis repens Lindl. Bot. Reg. pl. 1176 (1828), type from Northwest America. *Odostemon repens* Cockerell Univ. Mo. Stud. Sci. 2²:125 (1911). *Mahonia repens* G. Don, Dichlam. 118 (1831).

6. **B. aquifolium** Pursh. Mountain Grape. Stems erect, 1 to 3 feet high; leaves thin-coriaceous, bright-green and glossy-shining above, duller beneath; leaflets plane, 3 to 5 or 7, elliptic-ovate to oblong-ovate, 1¼ to 3 inches long, the margin with many long slender spines; lowest pair of leaflets remote from base of petiole; racemes fascicled in the axils and at the summit, dense, 1 to 2 inches long; berries blue, glaucous, rather large.

North Coast Ranges, from Napa Co. to Humboldt Co.; northern Sierra Nevada from Amador Co. to Modoc Co. North to British Columbia. Also called Hollyleaf Barberry.

Locs.—Near Mt. St. Helena, *Jepson;* Hupa, *Chandler* 1277; Edgewood, *J. W. Kisling;* Yreka, *Butler* 591; Lassen Creek, Modoc Co., *R. M. Austin;* Truckee, *Sonne;* Amador Co., *Gates.*

Var. **dictyota** Jepson n. comb. Erect, stout, ½ to 1 foot high, sparsely leafy; leaflets 5 to 7, broadly ovate, prominently reticulated, shining and yellow above, paler beneath, 1 to 2¼ inches long, undulate, sinuous-dentate, the 10 to 20 teeth with strong spines; lowest pair close to base of petiole; racemes dense, ¾ to 1 inch long.—Rocky slopes, Marysville Buttes.

Refs.—Berberis aquifolium Pursh, Fl. 1:219 t. 4, in part (1814), type loc. great rapids of the Columbia River, *Lewis;* Lindl. Bot. Reg. t. 1425 (1831). *Mahonia aquifolium* Nutt. Gen. 1:212 (1818). Var. dictyota Jepson. *B. dictyota* Jepson Bull. Torr. Club, 18:319 (1891), type loc. South Peak, Marysville Buttes, *Jepson;* Fl. W. Mid. Cal. 203 (1901). *Mahonia dictyota* Fedde in Engler, Bot. Jahrb. 31:89 (1901).

7. **B. pinnata** Lag. California Barberry. Stems erect, stout, branching, ¼ to 1½ feet high (or even to 4 or 5 feet); leaves 2 to 4 inches long; leaflets usually 7 to 13, but sometimes 5 to 17, rather crowded on the rachis, ovate-elliptical to oblong, thinnish and plane, somewhat bubbly-undulate, 1 to 2¼ inches long, shining above, somewhat paler beneath, shallowly sinuate-dentate, the numerous teeth prickly; lowest pair close to base of petiole; racemes clustered, dense.

Hill summits and slopes, mostly along the edge of thickets, Marin Co. to Monterey. Mar.-Apr.

Locs.—Marin Co., *Eastwood;* Berkeley Hills, *Jepson;* Lake Merced, San Francisco, *Jepson;* Colma Cañon, San Mateo Co., *Ehlers.*

Refs.—Berberis pinnata Lag. Elench. Hort. Madr. 6 (1803), type loc. Monterey, Cal.; Jepson, Fl. W. Mid. Cal. 204 (1901). *Mahonia pinnata* Fedde in Engler, Jahrb. 31:86 (1901).

8. **B. nervosa** Pursh. Oregon Grape. Stem scaly, caudex-like, simple, ½ to 1 (or 2) feet high, bearing the leaves in a terminal tuft; leaves 9 to 16 inches long, the rachis conspicuously nodose; leaflets 11 to 21, bright green, ovate to ovate-lanceolate, spinulose-serrate, and somewhat palmately nerved, 1½ to 3 inches long; scales of the strong terminal bud ¾ to 1¾ inches long, coriaceous-glumaceous; racemes erect, elongated, 2 to 4 (or 6) inches long; bracts oblong to lanceolate, membranaceous; berries blue-glaucous, 4 to 5 lines in diameter.

Woods near the coast from the Santa Lucia Mts. to Shasta and Siskiyou cos. Northward to British Columbia.

Locs.—Lucia to Mill Creek, *Jepson;* Mt. Tamalpais, *Bioletti;* Stewart Pt., *M. S. Baker* 761; Rockport (fruiting racemes 10 in. long), *Jepson;* Jackson Valley, Mendocino Co., *Jepson;* Pepperwood, *Jepson;* Eureka, *Tracy* 2016 (unbranched, 6 ft. high); Redwood Creek, n. Humboldt Co., *Jepson;* Hupa, *Chandler* 1286; Salmon Summit, *Jepson;* Russian Creek, w. Siskiyou, *Butler* 1287½. Vancouver Isl., B. C., *A. J. Pineo.*

Refs.—Berberis nervosa Pursh, Fl. 219, t. 5 (1814), type loc. Cascades, Columbia River, *Lewis;* Jepson, Fl. W. Mid. Cal. 204 (1901). *Mahonia nervosa* Nutt. Gen. 1:212 (1818). *Berberis glumacea* Lindl. Bot. Reg. t. 1426 (1831).

2. ACHLYS DC.

Perennial herbs with long-petioled 3-foliolate leaves and leafless scapes rising from a very slender rootstock. Flowers perfect, in a short dense spike. Calyx and corolla none. Stamens 9 to 13, 2 to 3 times as long as ovary, the outer dilated upward. Fruit dry, indehiscent, broadly moon-shaped. Species 2, one in Japan, the other in Pacific North America. (Greek Achlus, the god of night or gloom.)

1. **A. triphylla** DC. Deer-foot. Plants about 1 foot high; leaflets fan-shaped, sinuate-dentate, 2 to 6 inches broad.

Woods near the coast, 100 to 2500 feet, Mendocino Co. and northward. Also called Sweet Leaf. Settlers on the Humboldt coast, prizing the delicate fragrance, hang bunches of the leaves in their houses.

Locs.—Big River headwaters, *Jepson* 8424; Willits, *Jepson* 2408; Cahto to Dehaven, *Jepson;* Redwood Creek, n. Humboldt Co., *Jepson.*

Refs.—Achlys triphylla DC. Syst. 2:35 (1821), type from the Northwest Coast, *Menzies;* Jepson, Fl. W. Mid. Cal. ed. 2, 173 (1911). *Leontice triphylla* Smith, Rees Cycl. 20:5 (1812), type loc. Northwest Coast, *Menzies.*

3. VANCOUVERIA Morr. & Dcne.

Low perennial herbs with slender creeping rootstocks. Leaves once or twice ternately compound, all basal or nearly so. Flowers small, nodding, arranged in an open panicle on a slender scape-like peduncle. Sepals 6, in 2 series, obovate, petal-like, reflexed, subtended by 6 to 9 small calyx-like membranous bractlets. Petals 6, ligulate, tipped with a hood-like nectar-bearing appendage, reflexed.

Stamens 6, closely erect about the pistil, the anther connective produced into a pointed tip. Style 1; stigma thin, cup-shaped. Fruit a follicle. Seeds with an aril.—Species 3, Pacific North America. (Capt. George Vancouver of the English exploring ship Discovery, who visited San Francisco Bay in 1792.)

Leaflets with cartilaginous margin; panicle beset with gland-tipped hairs; stamens glabrous ..... 1. *V. parviflora.*

Leaflets not cartilaginous-margined; panicle glabrous; stamens covered with short gland-tipped hairs ..... 2. *V. hexandra.*

1. **V. parviflora** Greene. Inside-out Flower. Stems 8 to 20 inches high, sparsely hairy, at base rusty-pilose, the panicle pubescent with short spreading gland-tipped hairs; leaves glabrous or with rusty hairs on the petioles at the forks, persisting through the winter; leaflets thickish, roundish in outline, broadly cordate at base, with mostly closed sinus, obscurely or evidently 3-lobed with a notch at the summit of each lobe, ¾ to 1½ inches long, frequently broader than long, the margin cartilaginous and often crisped; panicle 2½ to 7 inches long, 25 to 55-flowered; flowers white or lavender-tinged, 4 lines long; sepals 2 lines long; stamens glabrous.

Shade of coniferous forests, mostly in the Redwood region, from the Santa Lucia Mts. to Humboldt Co. May-June 5.

Locs.—Pico Blanco, Monterey Co., *Davy* 7353; Big Basin, Santa Cruz Mts., *Copeland* 3051; Mt. Tamalpais, *Chesnut & Drew;* Redwood Peak; Calistoga, *Jepson;* Noyo River, *Charlotte Hoak;* Cahto, *Jepson* 1867; Grizzly Gulch, Humboldt Co., *Tracy* 2678; Salmon Summit, *Jepson.*

Refs.—Vancouveria parviflora Greene, Pitt. 2:100 (1890), based on plants of the Santa Cruz Mts. and Mt. Tamalpais; Jepson, Fl. W. Mid. Cal. ed. 2, 173 (1911). *V. chrysantha* Greene var. *parviflora* Jepson, Fl. W. Mid. Cal. 204 (1901).

2. **V. hexandra** Morr. & Dec. Flowering stems 7 to 21 inches high; leaves sparingly pubescent with short scattered hairs, perishing after the maturing of the fruit; leaflets thinnish, ovate to oval or roundish in outline (seldom broader than long), ¾ to 1½ inches long, cordate at base with open sinus, 3-lobed at apex (the middle lobe largest); panicle glabrous, 10 to 25-flowered; flowers 6 lines long; sepals 3 lines long; sepals and petals pearly white; stamens covered with small stipitate glands; ovules 3 in each cell.

Woods, 500 to 3000 (or even 4000) feet. Mendocino Co. to Siskiyou Co. and northward to Washington. Commonly in deeper shade than V. parviflora. May-June.

Locs.—Noyo River, *Charlotte Hoak;* Pepperwood, *Jepson* 1912; South Fork Mt., Humboldt Co., *Chesnut & Drew;* Humboldt Bay, *Chandler* 1162; East Fork Illinois River, Siskiyou Mts., *Jepson* 2935.

Refs.—Vancouveria hexandra Morr. & Dec. Ann. Sci. Nat. ser. 2, 2:351 (1834); Jepson, Fl. W. Mid. Cal. ed. 2, 174 (1911). *Epimedium hexandra* Hook. Fl. Bor. Am. 1:30, t. 13 (1829), type loc. Northwest Coast, *Menzies.*

LAURACEAE. Laurel Family.

Aromatic evergreen trees and shrubs with alternate simple leaves and no stipules. Flowers perfect, regular. Petals none. Anthers opening by uplifted valves. Ovary superior, 1-celled, 1-ovuled, with a single style. Fruit in ours a drupe.—Genera 39 and species about 1000, all continents, often in the temperate zones but mostly tropical.

1. UMBELLULARIA Nutt.

Flowers in simple peduncled umbels. Sepals 6. Stamens 9, the three inner with stipitate orange-colored gland on each side of the filament at base and alternating with scale-like staminodia; anthers 4-celled, 4-valved, the three inner extrorse, the outer introrse.—Species 1. (Latin umbellularia, a little umbel.)

1. **U. californica** Nutt. California Laurel. (Fig. 110.) Tree 20 to 60 feet high with a dense crown of erect slender branches, or in the chaparral as a mere shrub; leaves oblong or oblong-lanceolate, entire, 2½ to 4½ inches long, on short petioles; peduncles in the terminal axils, 4 to 7 lines long; umbels 4 to 9-flowered but only 1, 2 or 3 flowers set in fruit; sepals 1½ lines long; drupe subglobose or ovoid, 1 inch long, greenish or when ripe, brown-purple.

Mountain cañons and valley flats of the Coast Ranges and Sierra Nevada, south to San Diego Co. and north to southern Oregon. Very common.

Biol. and Econ. Note.—This tree takes on a variety of forms in different situations. It becomes: (*a*) a large tree in cañon flats, rich valleys or river bottoms; (*b*) gregarious in cañons, where its low colonies are often wind-controlled; (*c*) a small tree or bush on rock outcropping in the hills; (*d*) a slender dwarf 3 to 6 feet high in the chaparral; and (*e*) prostrate on the ocean bluffs, forming mats 1 to 2 feet high and 10 to 15 feet broad. As a large tree it is most abundant and of greatest size on the alluvial river flats of northwestern California and adjacent Oregon. The wood is odorous, heavy, hard and strong and takes a high

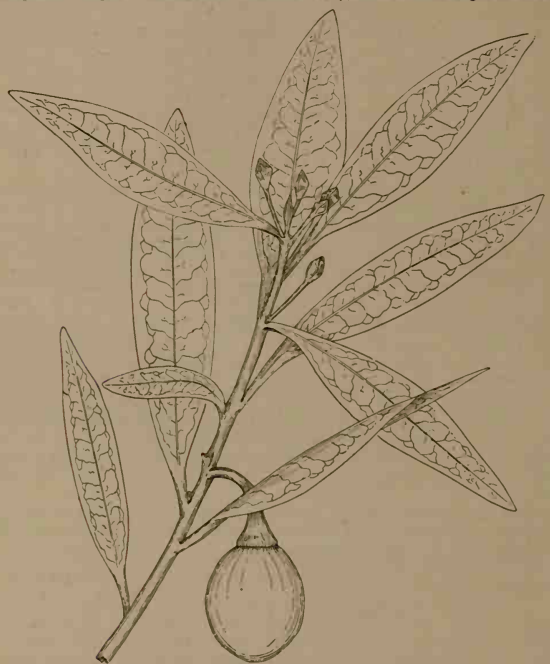

Fig. 110. Umbellularia californica Nutt. Fruiting branchlet, × 1.

polish. It is used for staves, shoe-lasts, turned articles, furniture and interior finish and is especially prized by the cabinet maker. It is also called Bay Tree and Bay-Laurel. In the woods of Mendocino and Humboldt cos. it is known as Pepperwood and in Oregon as Myrtle.

Locs.—East Fork Illinois River, Del Norte Co., *Jepson;* Myers Ranch, South Fork Eel River, *Tracy* 5101; Cahto, *Jepson;* Elk Creek, Mendocino Coast, *Jepson;* Mill Creek, Ukiah, *Jepson;* Cloverdale, *Jepson;* St. Helena, *Jepson;* Twin Sisters Peak, w. Solano Co., *Jepson* 2393; Mt. Tamalpais, *Jepson;* Berkeley, *Jepson;* Mt. Diablo, *Jepson;* Swanton, Santa Cruz Co., *Jepson;* San Antonio Trail, Santa Lucia Mts., *Jepson.* Sierra Nevada: Elsie Creek, Amador Co., *Hansen* 210; Gwin Mine, Calaveras Co., *Jepson;* Patterson Grade, Stanislaus Co., *A. L. Grant* 559; Hetch-Hetchy, *Jepson;* Cedar Creek, Sequoia Park, *Jepson;* South Fork Kaweah River, *Jepson.* Southern California: Santa Inez Mts., *Brewer* 326; Santa Monica Cañon, *J. H. Barber* 7; San Antonio Cañon, *C. F. Baker* 3686; Mt. Ontario, *Aurelia S. Harwood;* San Jacinto Mts., *Hall* 520.

Refs.—Umbellularia californica Nutt. N. Am. Sylv. 1:87 (1842); Jepson, Fl. W. Mid. Cal. 191 (1901), Silva Cal. 242, pls. 10, 76 (1910)

PAPAVERACEAE. Poppy Family

Herbs or shrubs with mostly colored juice and regular complete flowers. Sepals 2 or 3, caducous, the petals twice as many. Calyx in Eschscholtzia resembling a fool's cap, the 2 sepals completely united into a single piece. Stamens numerous, rarely few. Pistil 1, composed of 2 to several united carpels; ovary superior, 1-celled (several-celled in Romneya); in Platystemon the lightly united carpels become distinct in fruit.—Genera 23 and species about 100, mostly extratropical in the north temperate zone.

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Sepals distinct, caducous; receptacle not hollowed (slightly hollowed in no. 6).
- Leaves usually opposite or whorled, entire.
  - Stamens numerous; carpels lightly joined, distinct in fruit.....1. Platystemon.
  - Stamens 6 to 12 or numerous; carpels combined into a 3-angled or linear ovary.....2. Meconella.
- Leaves alternate or mainly so, often in a basal tuft.
  - Stamens 6 to 9; minute annual.....3. Canbya.
  - Stamens many or numerous.
    - Herbs; leaves toothed, lobed or pinnatifid.
      - Petals deciduous; stigmas opposite (that is, over) the placentae.
        - Flower buds erect; petals white; herbage prickly.....4. Argemone.
        - Flower buds drooping; petals red; herbage not prickly.....5. Papaver.
      - Petals persistent around the capsule; stigmas alternate with the placentae; herbage not prickly.....6. Arctomecon.
    - Shrubs or at least woody at base.
      - Petals white; leaves pinnatifid; capsule ovate, 7 to 12-valved.....7. Romneya.
      - Petals yellow; leaves entire or merely denticulate; capsule linear, 2-valved.....8. Dendromecon.

Sepals united into a calyptra or foolscap body which is pushed off by the 4 expanding petals; receptacle hollowed.....9. Eschscholtzia.

1. PLATYSTEMON Benth.

Low annual with mainly opposite entire leaves. Sepals 3. Petals 6 in two series, tardily deciduous, withering and closing over the forming fruit. Stamens numerous; filaments more or less dilated and petal-like. Stigmas subulate-filiform, one terminating each carpel; carpels 6 to 17 or 20, each several-ovuled, connivent or coherent in a circle, becoming moniliform, at maturity separating and breaking transversely into indehiscent 1-seeded joints.—Species 1, southwestern United States and Lower California. Anthesis lasting for more than one day. (Greek platus, broad, and stemon, a stamen.)

1. **P. californicus** Benth. Cream Cups. (Fig. 111.) Branched from the base, the branches widely spreading and more or less decumbent, or often erect, 3 to 9 (or 12) inches high, the leaves often borne on the lower part (or wholly basal) and the pedūncles therefore more or less scape-like and 2 to 7 (or 10) inches long; herbage pilose; buds round-obovoid, elliptic or oblong, long-hairy; petals commonly cream yellow, 3 or 6 to 11 lines long.

Foothills, plains and valleys, in sandy or clay soils, common almost throughout California, but absent from the deserts, except the western margins of the Colorado and Mohave. East to Arizona and Utah; south to Lower California.

Note on Variability.—Platystemon californicus is a plant of fairly uniform habit and fairly uniform vegetative characters. Its stems, mode of branching and its leaves are essentially constant, although individuals vary in amount of hairiness. Its flowers are nearly uniform in size and shape, and reasonably constant in size, shape and number of the parts in the calyx and corolla circles. The androecium sometimes exhibits marked variability, but of the two inner circles of the flower, variation affects more strongly the gynoecium. Variations in the carpellary circle frequently become strikingly pronounced and highly eccentric and irregular in character. The carpels are indeed highly variable in the degree to which they become moniliform in fruit and this fact is undoubtedly correlated with fertilization of the ovules. Under normal fertilization the carpels become strongly moniliform (Fig. 112*c*), the beads indicating the position of the seeds. On the other hand torulose carpels are commonly without seeds or sometimes with one or two (Fig. 112*d*). In some cases a mature carpel contains one or two distinct beads each with a seed at its center, while the remainder of the carpel is beadless,, dissection showing that the beadless portion is vacant and seedless. It seems evident that moniliform carpels are those which have developed seeds, and torulose (or cylindric) carpels those which have failed or partially failed to develop seeds.

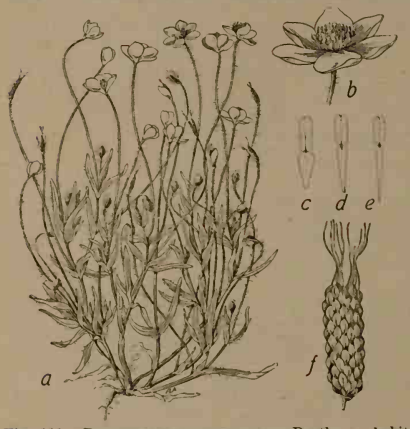

Fig. 111. Platystemon californicus Benth. *a*, habit, × ¼; *b*, flower, × 1; *c*, *d*, *e*, stamens showing variation in filaments, × 4; *d*, circle of moniliform carpels, × 1½.

Greene's segregates of Platystemon californicus (Pitt. 5:158–194) are 52 in number (one of them a revival). The primary division of his key, as well as various subdivisions, rests upon characters of the carpels, especially upon the distinction "carpels torulose" or "carpels moniliform." Since moniliform carpels have been shown to be those whose seeds have developed, and torulose carpels those whose seeds have not developed, the uneasy foundation of these segregates is disclosed. In some cases, as will be shown below, both cylindric and moniliform types of carpels may be found on a single individual (spms. from San Diego, *K. Brandegee*). This one fact goes far to cancel most of the numerous specific segregates of Greene and Fedde, and much other evidence tends to destroy the others or cast a heavy shadow of doubt upon them.

The carpels furthermore vary greatly in hairiness, a character used freely for specific diagnosis in the Pittonia paper. Possibly this character is correlated with sterility or fertility, just as is the moniliform or torulose character. More remarkable still it may often happen that two or three circles of carpels will be produced in a single flower, the circles not differing from the normal single circles of other flowers on the same plant or on other plants of the same collection (Fig. 112). In other words, a single flower often bears 2 or 3 pluricarpellary gynoecia, each gynoecium composed of a circle of regular carpels.

In the following attempted brief analysis of variability in this species it has been found difficult to cite the segregates published in Pittonia or in the Pflanzenreich, for the reason that while a single character may be repeated in a second collection, no set of characters of a collection has been found wholly repeated in another collection from another locality, or often indeed from the same locality. We thus have at least partial explanation of the solitary citations of specimens in Fedde's account of the genus in Engler's Pflanzenreich, bd. 4, teil 104, where he recognizes 57 species. Of these, 33 are indicated by only a single collection, while 10 more are credited with only two collections.

I. Variation in habit or in vegetative organs

1. Tendency to nanism. Plants in sterile or clay soils tend to be smaller, less branched, or commonly with the leaves in a basal tuft and the flowering stems scape-like: Crane Creek, w. Tehama Co., *Jepson;* Ft. Seward Ridge, *Jepson* 1902; Kelseyville, Lake Co., *Chandler;* betw. Coalinga and Parkfield, *K. Brandegee.*

2. Tendency to strong foliation. Plants in sandy or moist soils show luxuriant leafy stems: Humboldt Bay, *Tracy* 2046; Olema, *Jepson* 8283; Ingleside, *Jepson* 2128.

3. Tendency to extreme crinitism. Plants of the interior towards the south, especially in the southern Sierra Nevada and neighboring ranges, show a tendency to extreme hairiness of stems, buds or fruits (especially when young): Springville, Tulare Co., *Purpus* 1749. Cf. *P. horridulus* Greene and *P. villosus* Greene. Continuous intergrades are represented by spms. from Ft. Tejon, *Hall* 6290, Caliente, Kern Co., *Jepson* 6756, Caliente Creek, *Davy* 1934.

II. Variation in reproductive organs

1. Calyx. (*a*) The flower buds are commonly obovoid but sometimes globose. The globose character is not definitely correlated with other characters. (*b*) The usual form of calyx is moderately pilose with somewhat scattered hairs; sometmes it is very hairy (Erskine Creek, Kern Co., *Purpus* 5000) or excessively hairy (Springville, Tulare Co., *Purpus* 1749). There are regular intergrades from these extreme states to the ordinary form.

2. Corolla. The corolla is commonly saucer-shaped but is sometimes rotate or turbinate at base. The petals are commonly cream color. The following color variations may be noted: (*a*) A deeper or yellow color occurs at apex, with this color sometimes repeated as a spot at base. (*b*) The petals are yellow throughout: sand dunes, Little River beach (Humboldt Co.), *Tracy* 4797. (*c*) The petals are sometimes lemon yellow with white base: Humboldt Bay, *Tracy* 2020 (which is, save for color, exactly the same as *Traey* 2034, same loc., petals creamy white throughout). (*d*) The petals are pure white: Poso Creek, Greenhorn Range, *Hall & Babcock* 5016. (*e*) The petals are white with definite yellow blotch at base: Poso Creek, *Hall & Babcock* 5018. (*f*) The petals are white with definite yellow blotch at base and another at tip: Poso Creek, *Hall & Babcock* 5069 (the three preceding numbers of Hall & Babcock differ only in color of petals). (*g*) The petals are sometimes deep rose pink outside on the upper half. (*h*) The petals are reddish tipped in spms. from Priest Valley, se. Monterey Co., *Jepson* 2687, but a dupl. sheet shows the normal cream color. Cf. *P. purpuratus* Greene; *P. antoninus* Greene; *P. obtectus* Greene var. *sanctarum* Greene. The petals are normally entire; however in spms. from near the coal mines betw. Antioch and Marsh Creek, *K. Brandegee*, some of them are weakly lobed, especially the outer.

Fig. 112. Platystemon californicus Benth. *a*, flower bearing 2 distinct gynoecia, each gynoecium composed of several normal carpels; *b*, flower with 3 gynoecia; *c*, *d*, flowers with moniliform and cylindric carpels borne on the same plant.

3. Stamens. The filaments are usually dilated, the outer ones broader than the inner (fig. 111). The following variations may be noted: (*a*) The filaments are very broad and 3-toothed at apex in a plant from Tiburon, *K. Brandegee*, but other plants in same collection have narrower filaments which are not 3-toothed. Cf. *P. heterander* Greene and *P. subcercus* Greene. (*b*) The outer filaments are moderately broad: Pt. Richmond, *Hall* 1654, and Ocean View, San Francisco Co., *K. Brandegee* (in the latter the outer filaments are obcordate or retuse). In many specimens the outer filaments are often 2-toothed with the inner filaments entire.

4. Carpels: (*a*) Many specimens have flowers showing a tendency to produce two or three distinct pluricarpellary circles, the fruiting carpels being extremely hairy (especially when immature). In some such specimens the beads of the fruit are not well rounded but are more or less cylindric: Riverside, *Brandegee & Wilder*: Marysville Buttes, *Heller* 11246. In other cases the fruits have the beads well rounded: Coahuilla Valley, Riverside Co., *Jepson* 1470. Such double or triple circles of carpels are teratological and are borne on plants with single or normal circles and often show intergrade states. (*b*) Other specimens have flowers showing a tendency to produce two distinct pluricarpellary circles, the fruiting carpels not at all hairy: San Felipe Valley, e. San Diego Co., *Jepson* 8734; Hog Cañon, San Bernardino Valley, *Parish* 5746 (in one flower there are 3 carpellary circles); Oceanview, San Francisco, *K. Brandegee* 10p. Such extra circles of non-hairy fruits are likewise teratological. (*c*) Many specimens have torulose carpels which are empty or 1 or 2-seeded and hairy (sometimes densely so): Bardin's Switch betw. Castroville and Monterey, *K. Brandegee* 2a, 2b, 2d, 2f, 2p, 3p, 4p; Riverside, *Brandegee & Wilder* 2; Botanic Garden, Berkeley, plants from Lake Merced (San Francisco) seed, *K. Brandegee* (anthers apparently never producing pollen). Cf. *P. capsularis* Greene; carpels seedless except externally, that is within the cavity formed by union of the carpels, rarely torulose and breaking into 1-seeded joints (ex. char.). (*d*) Moniliform carpels, usually glabrous or nearly so, are frequently found, each bead denoting the position of a seed: Ocean View, San Francisco, *K. Brandegee* 5p, 6p, 7p; betw. Antioch and Marsh Creek, *K. Brandegee*. (*e*) Again we have specimens in which the types of carpels in *c* and *d* are present as to shape and seed, but conspicuously hairy (as often in *c*): Ocean View, San Francisco Co., *K. Brandegee*

8p. (*f*) Sometimes we have very interesting specimens which bear on the same plant both moniliform carpels with rounded beads and carpels in which the beads are short-cylindric instead of rounded, all seed-bearing: San Diego (ocean cliffs), *K. Brandegee* 1p. Cf. *P. sphaerocarpus* Greene. (*g*) In other cases the fruiting carpels are unusually long (9 to 11 lines), the carpels each with an obvious dorsal keel: Sutter plains, *Jepson;* Antioch to Marsh Creek, near the coal mines, *K. Brandegee* a. Cf. *P. emarginatus* Greene. (*h*) The fruiting carpels are sometimes twisted and either sterile or fertile: Ocean View, San Francisco, *K. Brandegee* 12p, 13p, 14p, 15p. Cf. *P. contortus* Greene, based on a spm. from Lake Co., or Colusa Co., *Curran.* (*i*) There is frequently a tendency to extreme hairiness of carpels. This variation seems correlated with extreme hairiness of stems and buds, especially when young: Springville, Tulare Co., *Purpus* 1749. On the other hand the reverse correlation is not true, since *Purpus* 5000 (Erskin Creek, Kern Co.) has very hairy buds and stems, but glabrous carpels.

It is possible that further collections and field studies may show some of the specific segregates, listed below as reductions, to be of varietal rank, but it is more likely that accumulation of knowledge concerning the range and kind of variation will destroy this possibility. No other Californian species seems so inviting for a study of fluctuating variability, particularly in intensive garden cultures. It is probable that such work would reveal the most unexpected surprises.

Locs.—Coast Ranges: Dinsmore Ranch, near Buck Mt., Humboldt Co., *Tracy* 4139; Fort Seward Ridge, Humboldt Co., *Jepson* 1902 (3000 ft.); Cahto, Mendocino Co., *T. Brandegee;* Snow Mt., Lake Co., *T. Brandegee;* Sites, Colusa Co., *K. Brandegee;* St. Helena, *Jepson* 6240; Yountville, *Jepson;* Berkeley, *Jepson;* Moraga Valley, *Jepson;* Crystal Springs Lake, San Mateo Co., *C. F. Baker* 433. Great Valley: Crane Creek, Salt Creek and Wimmeshaw, w. Tehama Co., *Jepson;* Chico, *Heller* 10718; Sutter plains, *Jepson;* Wilson Creek, Vacaville, *Jepson;* Tracy, *C. F. Baker* 2780; Madera, *Davy* 1697. Sierra Nevada: Weber Creek, Eldorado Co., *K. Brandegee;* Phoenix Lake, Tuolumne Co., *A. L. Grant* 50; Greenhorn Range, *Hall & Babcock* 5016. Southern California: Swarthout Cañon, San Antonio Mts., *Hall* 1520; Colton, *Parish;* Thomas Valley, San Jacinto Mts., *Hall* 543; Ramona, *Jepson* 8514; San Felipe Valley, e. San Diego Co., *Jepson* 8734.

Var. **crinitus** Greene. Peduncles and buds with longer hairs, often densely pilose; buds globose; petals yellow, often with pink or greenish tips—Tehachapi Mts. south to the Cuyamaca Mts.: Tehachapi, *Greene;* Coahuilla Valley, Riverside Co., *Jepson* 1470. This variety is not definitely different from the species but merely represents a terminus of a line of variation.

Var. **horridulus** Jepson n. comb. Petals spreading nearly rotately from a turbinate or almost cylindric base 3 to 4 lines long; carpels white when young with a dense covering of stiffish hairs, the hairs rapidly deciduous and the carpels soon becoming only thinly hairy.—Southern Sierra Nevada foothills from Fresno Co. to Tulare Co., 3500 to 5000 ft.: ridge n. of Pinehurst, Fresno Co., *Ottley* 1438, *Newlon* 202; e. of Springville, Tulare Co., *Purpus* 1749. The following spms. have carpels destitute of the heavy coat of hairs just described, being in pubescence similar to the ordinary form of Platystemon californicus, but they have turbinate corollas in various degrees or intergrades: Pleasant Cañon, Panamint Mts., *Hall & Chandler* 6958; Erskine Creek, Kern Co., *Purpus* 5000; Leonis Valley, betw. Manzana and Gorman, *Davy* 2659. These facts evidence that the corolla character is more constant than the pubescence character, although the latter is the more striking. In those plants (as first cited above) where both characters are found intensified we have a state which is really an extreme in a series of variations.

Var. **nutans** Brandegee. Fruits nodding.—Coast of Southern California; San Diego, *T. Brandegee;* Santa Cruz Isl., *T. Brandegee.*

Refs.—Platystemon californicus Benth. Trans. Hort. Soc. Lond. ser. 2, 1:405 (1835), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 205 (1901). Var. crinitus Greene, Fl. Fr. 282 (1892). *P. crinitus* Greene, Pitt. 2:13 (1889), type loc. Tehachapi, *Greene.* Var. horridulus Jepson. *P. horridulus* Greene, Pitt. 5:178 (1903), type loc. betw. Sequoia and Sanger Mills, Fresno Co., *Eastwood.* Var. nutans Brandg. Zoe 5:177 (1903), type loc. San Diego, *T. Brandegee.* *P. nutans* Greene, Pitt. 5:192 (1903).

The following additional segregates are here alphabetically arranged: *P. aculeolatus* Greene, Pitt. 5:167 (1903), type loc. Santa Barbara Isl., *Trask;* depressed, about 5 inches broad; corolla ¼ inch broad (ex. char.). *P. acutatus* Greene l.c. 187, type loc. Middle Tule River, *Purpus;* Fedde in Engler, Pflzr. 4^{108}:126, fig. 18A-c (1909). *P. anemonoides* Greene, l.c. 177, type loc. Alcalde, w. Fresno Co., *Eastwood.* *P. antoninus* Greene l.c. 180, type loc. San Antonio River, Santa Lucia Mts., *Eastwood.* *P. arvorum* Greene l.c. 174, type loc. Tracy, *C. F. Baker* 3199. *P. californicus* var. *sphaerocarpus* T. Brandegee, Zoe 5:177 (1903), type loc. Colusa Jct., *T. Brandegee.* *P. capsularis* Greene l.c. 165, type loc. San Simeon, *T. Brandegee;* Fedde l.c. 116, fig. 15c. *P. communis* Greene l.c. 169, type loc. San Rafael, *J. P. Moore;* Fedde l.c. 117, fig. 15E *a-c;* var. *stylosus* Greene l.c. 170, based on spms. from San Francisco Co., *Kellogg & Harford,* and Redwood Cañon, Marin Co., *Michener & Bioletti;* Fedde l.c. 117, fig.

15ED. *P. cernuus* Greene l.c. 193, type loc. Santa Catalina Isl., *Trask;* Fedde l.c. 131, fig. 18R, S. *P. commixtus* Greene l.c. 176, type loc. Lake Co. or Colusa Co. *P. contortus* Greene l.c. 175, based on a spm. from Lake Co. or Colusa Co., *Curran.* *P. crenatus* Greene l.c. 175, type loc. Lake Co. or Colusa Co., *Curran.* *P. elegans* Greene l.c. 178, type loc. San Emigdio, Kern Co., *Eastwood.* *P. emarginatus* Greene l.c. 172 (1903), type loc. foothills near Stanford, *C. F. Baker* 665. *P. exsculptus* Greene l.c. 182, type loc. Antioch, *Brandegee;* Fedde l.c. 123, fig. 16H, J. *P. glyptolobus* Greene l.c. 182, type loc. Lakeport, *C. F. Baker* 3058. *P. greeneanus* Fedde, Ber. Deutsch. Bot. Ges. 22:94, fig. 2 (1904), based on Mendocino, *H. E. Brown* 811, and Bodega Point and Point Reyes, *Eastwood;* Engler, Pflzr. 4[104]:114, fig. 15B (1909). *P. hallii* Fedde l.c. 130, fig. 18N, type loc. Kenworthy, San Jacinto Mts., *Hall* 1144. *P. heterander* Greene l.c. 181, type loc. Butte Co. foothills, *C. C. Bruce.* *P. hispidulus* Greene l.c. 193, type loc. San Nicolas Isl., *Trask;* Fedde l.c. 131, fig. 18P, Q. *P. hyacinthinus* Greene l.c. 180, type loc. Thomas Valley, Mt. San Jacinto, *Hall* 543; Fedde l.c. 121, fig. 16F, G; approaches closely *P. crinitus* Greene. *P. intermedius* Fedde l.c. 119, type loc. Alameda Co., *W. P. Gibbons.* *P. leptander* Greene l.c. 190, type loc. Huron, Fresno Co., *T. Brandegee.* *P. leucanthus* Greene l.c. 188, type loc. San Bernardino foothills, *Parish.* *P. loesenerianus* Fedde l.c. 128, type loc. Riverside, *Hall* 3794. *P. mendocinus* Greene l.c. 181, Cahto, Mendocino Co., *Eastwood.* *P. microlobus* Greene l.c. 189, type loc. Arroyo Grande, *Alice King.* *P. nigricans* Greene l.c. 174, type loc. Midway sta., e. of Livermore, *Greene;* Fedde l.c. 118, fig. 15J. *P. obtectus* Greene l.c. 186, type loc. Witch Creek, San Diego Co., *R. D. Alderson;* Fedde l.c. 124, fig. 17; var. *sanctarum* Greene l.c. type loc. Santa Lucia Mts., *Eastwood.* *P. ornithopus* Greene l.c. 167, type loc. Santa Barbara Isl., *Brandegee.* *P. pectinatus* Greene l.c. 184, type loc. Alcalde, Fresno Co., *Eastwood.* *P. penicillatus* Greene l.c. 185, type loc. "Santa Maria Mts." *P. petrinus* Greene l.c. 166, type loc. San Pedro, *Brandegee.* *P. pilosellus* Greene l.c. 185, type loc. Madera, *P. S. Buckminster.* *P. proximus* Greene l.c. 172, type loc. Chico, *R. M. Austin, H. E. Brown;* Fedde l.c. 118, fig. 15F. *P. purpuratus* Greene l.c. 168 based on spms. from Monterey and Castroville, *Brandegee, Greene.* *P. quercetorum* Greene l.c. 173, type loc. Oakland, *Chesnut;* Fedde, l.c. 120, fig. 15H. *P. rugosus* Greene l.c. 183, type loc. Pilot Ridge, Eldorado Co. foothills, *Eastwood.* *P. setosus* Greene l.c. 194, type loc. Santa Barbara Isl., *Trask.* *P. sphaerocarpus* Greene l.c. 168, type loc. Colusa Jct., *T. Brandegee;* Fedde l.c. 117, fig. 15D. *P. subereus* Greene l.c. 184, type loc. Colusa Co., *Brandegee.* *P. tesselatus* Greene l.c. 171, type loc. Briones Hills, Contra Costa Co., *Greene.* *P. tortuosus* Greene l.c. 170, type loc. Tracy, *C. F. Baker* 2780. *P. turbinatus* Greene l.c. 188, type loc. Visalia, *T. J. Patterson;* Fedde l.c. 127, fig. 18D. *P. tympaniferus* Fedde l.c. 124, fig. 16K, L, type loc. Kenworthy, San Jacinto Mts., *Hall* 1144. *P. verecundus* Greene l.c. 191, type loc. San Diego, *Greene;* Fedde l.c. 130, fig. 18O. *P. villosus* Green l.c. 165, type loc. Bodega Pt., *Eastwood.*

2. **MECONELLA** Nutt.

Annual herbs with opposite leaves. Sepals 3, rarely 2. Petals 6, rarely 4, deciduous. Stamens 6 to 12, or numerous. Carpels 3, combined into a single 1-celled ovary, which is 3-lobed or nearly terete. Placentae as many as the carpels, parietal, many-ovuled. Stigmas ovate to subulate. Capsule completely 3-valved, dehiscent through the placentae.—Species 2, California to British Columbia. (Greek mekon, poppy, and ella, dimmutive.)

Plants with the leaves all basal or sub-basal and with unbranched hairy scapes; petals light yellow; ovary and capsule narrowly obovoid, 3-lobed ..... 1. *M. linearis.*

Plants with branching leafy stems and glabrous peduncles; petals white; ovary and capsule linear ..... 2. *M. oregana.*

1. **M. linearis** Jepson n. comb. (Fig. 113.) Plants with the leaves all basal or nearly so, the scapes 4 to 8 inches high and hispid with spreading hairs; leaves linear, 1 to 2¼ inches long, sessile; sepals brownish; petals light yellow, cuneate-orbicular or obovate, 4 to 9 lines long; stamens numerous, filaments linear or oblong-dilated, rarely filiform; body of capsule 5 to 7 lines long.

Sandy soil in the Coast Ranges from Sonoma Co. to Santa Barbara Co., chiefly near the coast, but inland to the southern Sierra Nevada (Fresno Co. to Kern Co.); north to Oregon. Mar.-Apr.

Locs.—Sierra Nevada: near Fresno, *Hcaton;* Kaweah, *Hopping* 254; Keene sta., Kern Co., *Heller* 7807. Coast Ranges: Santa Barbara Co., *Summers* 21; Castroville, *K. Brandegee;* San Francisco, *C. E. Michener* (*Hesperomecon platystemon* Greene); Oakland, *Holder* 2521; Antioch, *Chesnut & Drew* (*Hesperomecon angustum* Greene).

Note on variation.—The filaments are narrowly linear to oblong, rather rarely filiform. Filiform filaments may frequently be found in the same flower with broader filaments, especially in the case of dwarfed plants: Rowen, Tehachapi Range, *Jepson* 6715; betw. Marcell and

Keene, Kern Co., *K. Brandegee* 98; San Francisco, *K. Brandegee* 1x. There is no definite constancy yet worked out between filament breadth and other characters. The ground color of the petals is mostly cream color with a yellow phase at base; the outer 3 are often deep yellow, egg-yellow, or egg-yellow and cream in varying proportions, or with a yellow central splotch. Sometimes the flowers are white with yellow center, sometimes the flowers fade to rose-pink. The striking color form, var. **pulchellum** Jepson n. comb., has the outer petals yellow, the inner white, but this color scheme is not correlated definitely with any other characters; it occurs on the Sonoma Co. and San Francisco Co. coasts.

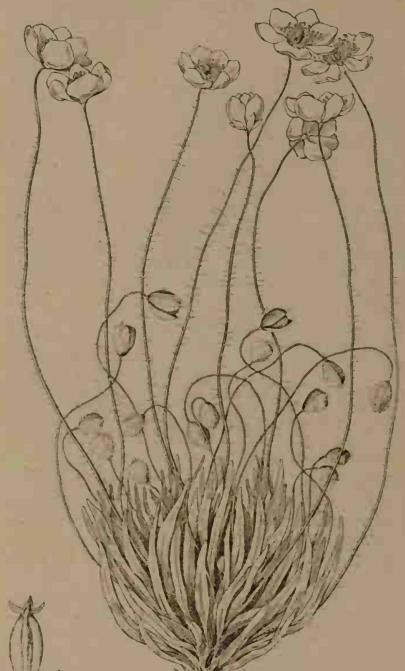

Fig. 113. MECONELLA LINEARIS Jepson. *a*, habit, × 1; *b*, capsule, × 1.

Refs.—MECONELLA LINEARIS Jepson. *Platystigma lineare* Benth. Trans. Hort. Soc. ser. 2, 1:407 (1835), type a garden plant (Cal. seed, *Douglas*); Hook. Ic. Pl. t. 38 (1836), filaments linear-filiform, Monterey, *Douglas;* Jepson, Fl. W. Mid. Cal. 206 (1901). *Hesperomecon affine* Greene, Pitt. 5:147 (1903), type loc. Exeter, *Eastwood*, is intermediate between the species and *H. platystemon* Greene, that is the filaments are filiform, the outer dilated. *H. platystemon* Greene l.c. 148 (1903), type loc. San Francisco, *Kellogg*. *H. strictum* Greene l.c. 149 (1903), type loc. San Luis Obispo, *Parry*. *H. angustum* Greene l.c. 149 (1903), type loc. Antioch sand hills, *Greene*. *H. luteolum* Greene l.c. 150 (1903), based on spms. from Ben Lomond (Santa Cruz Co.) and Castroville (Monterey Co.), *T. Brandegee*. Var. PULCHELLUM Jepson. *H. pulchellum* Greene l.c. 150 (1903), based on Bot. Reg. t. 1954 (1837), an illustration of a garden plant, the seed originally from Fort Ross, Sonoma Co.; cf. also Hook. Bot. Mag. t. 3575 (1837).

2. **M. oregana** Nutt. var. **californica** Jepson n. comb. (Fig. 114.) Very slender, erect, branching, 4 to 7 inches high, glabrous throughout; leaves entire, the basal and lower ones elliptic to obovate-spatulate, ½ to 1 or 1½ inches long, commonly contracted to a petiole, the upper cauline oblanceolate to linear; peduncles 2 to 3 inches long, erect in anthesis, in fruit deflexed almost horizontally but the capsule vertical or nearly so; sepals often reddish; petals white, elliptic to oblong, 2 to 5 lines long; stamens 12, unequal, in two series, the outer shorter; filaments filiform or slightly dilated upwards; capsule linear, twisted, ½ to 1 (rarely 1½) inches long.

Sierra Nevada foothills from Shasta Co. to Amador Co.; San Francisco Bay region; extending south in the Sierra foothills and to cismontane Southern California in slightly modified forms.

Locs.—Little Chico Creek, *R. M. Austin;* Sweetwater Creek, Eldorado Co., *K. Brandegee;* Auburn, *Bolander* 4524; Berkeley Hills, *Chandler* 884; San Bruno Hills, *Jepson.* The species is variable, like its allies and the following varieties may be, with the further results of field studies, shown to be mere forms: Var. **octandra** Jepson n. comb. Petals almost fan-shaped; stamens 8, the 4 outer shorter.—Southern Sierra foothills (or their bordering plains) from Merced Co. to Tulare Co.: Merced, *T. Brandegee;* Kaweah, *Hopping.* Var. **denticulata** Jepson n. comb. Leaves entire, sometimes denticulate; stamens 6, in one set.—Cismontane Southern California: Santa Inez Mts. near Santa Barbara, *T. Brandegee;* Santa Cruz Isl., *T. Brandegee;* Millards Cañon, San Gabriel Mts., *Peirson* 36; San Bernardino, *Parish;* Ramona, *T. Brandegee.*

Refs.—MECONELLA OREGANA Nutt.; T. & G. Fl. 1:64 (1838), type loc. lower Willamette Valley, *Nuttall;* var. CALIFORNICA Jepson. *M. californica* Torr. in Frem. Rep. Sec. Exped. 312 (1845), type loc. American River, doubtless in the Sierra foothills, *Fremont. Platystigma californicum* Brew. & Wats. Bot. Cal. 1:20 (1876); Jepson, Fl. W. Mid. Cal. 206 (1901). *M. collina* Greene, Pitt. 5:143 (1903), type loc. San Bruno Hills, *Kellogg.* Var. OCTANDRA Jepson. *M. octandra* Greene l.c. 142, type loc. Salt Creek, Kaweah River, *Eastwood.* Var. DENTICULATA Jepson. *M. denticulata* Greene, Bull. Cal. Acad. 2:59 (1886), type loc. Temecula Cañon, n. of Mission San Luis Rey, San Diego Co., *Greene. Platystigma denticulatum* Greene, Bull. Torr. Club 13:218 (1886). *M. kakoethes* Fedde, Rep. Nov. Sp. 3:275 (1907), type loc. San Diego, *Orcutt.*

Fig. 114. MECONELLA OREGANA Nutt. var. CALIFORNICA Jepson. *a*, habit; *b*, capsule. × 1.

3. **CANBYA** Parry

Minute glabrous annuals with the leaves crowded in a dense basal tuft on the very shortly branched stems. Leaves mostly alternate, linear, fleshy, entire. Flowers on axillary filiform pedicels. Sepals 3. Petals 6, white, after anthesis withering and closing over the capsule. Stamens 6 (or 5) to 9. Ovary 1-celled, with 3 nerve-like placentae. Style none. Stigmas 3, linear, radiate-recurved and appressed to the subglobose ovary. Ovules several.—Species 2, California and Oregon. (W. M. Canby, botanist of Delaware.)

Fig. 115. CANBYA CANDIDA Parry. *a*, plant, × 1; *b*, flower, × 2.

1. **C. candida** Parry. (Fig. 115.) Plants 1 inch high; leaves fleshy, 2 to 4 lines long; petals roundish, 1 to 1¾ lines long.

Sandy washes, Mohave Desert, 2000 to 3500 feet. Apr.-May.

Locs.—Coolgardie yucca mesa, *Jepson* 6703; Calico Wash, ne. of Barstow, *Jepson* 5815; Blacks Ranch near Fremont's Peak, *Hall & Chandler* 6842; Kramer, *K. Brandegee;* near Cajon Pass, *Jepson* 6125; Lancaster, *Davidson;* Little Rock Creek, *Peirson* 2412.

Refs.—CANBYA CANDIDA Parry in Gray, Proc. Am. Acad. 12:51, pl. 1 (1876), type loc. towards head of Mohave River, *Palmer* in 1876.

4. **ARGEMONE** L.

Annual herbs with acrid orange juice, prickly sinuate or pinnatifid leaves and flowers erect in the bud. Sepals 2 (often 3), with a horn-like appendage below the apex. Petals white, twice as many as the sepals. Ovary 1-celled; stigmas radiate. Capsule 4 to 6-valved at summit.—Species 6, North and South America, in the tropics and warm temperate regions. (Greek name of some herb, transferred here.)

Calyx rather densely spiny; horn-like appendage of sepals large or conspicuous, spine-tipped and with many spines over its surface; flowers not corymbose.....1. *A. platyceras.*

Calyx with scattered spines; horn-like appendage of sepals small or inconspicuous, spine-tipped, its surface otherwise unarmed; flowers corymbose.....2. *A. intermedia.*

1. **A. platyceras** Link & Otto. CHICALOTE. Stems stout, branched, more or less prickly with long yellow spines, 1½ to 2¾ feet high; herbage glaucescent; leaves oblong, sinuate-pinnatifid into spinose-toothed lobes, tapering to a winged petiole, spinose chiefly along the margin and along the main veins, 2 to 9 inches long; flowers in leafy-bracteate panicles; sepals 3, spiny, each with a horn at apex, the horns lanceolate, spiny on the sides and strongly spine-tipped; petals 6, obovate, truncate, 1 to 2 inches long; capsule narrowly cylindrical, 1½ to 2 inches long, the valves firm, becoming somewhat indurated, densely spiny.

Southern California. East to Texas. Apr.-July.

Locs.—Tehachapi Valley, *Jepson* 7431; Sisquoc River Valley, Santa Barbara Co., *M. S. Baker;* Mt. Pinos, Ventura Co., *Hall* 6504; San Jacinto Valley, *Reinhardt;* Laguna Mts., San Diego Co., *T. Brandegee;* Split Mt., *T. Brandegee;* Chuckawalla Mts., *Hall* 5970.

Passing by intergrades into the var. **hispida** Prain, the whole plant densely setose-hispid as well as armed with stouter yellow spines.—Coast Ranges; e. side of the Sierra Nevada; mountains of Southern California; 2000 to 8000 feet, June-Sept.: Gravelly Valley, n. Lake Co., *Jepson;* New Idria, San Benito Co., *Brewer* 768; San Antonio Cañon, San Antonio Mts., *Peirson* 55; Burnt Corral Mdw., Little Kern River, *Jepson* 1039; foot of Bloody Cañon, Mono Co., *Chesnut & Drew;* Milford, Lassen Co., *M. S. Baker.* Reno, Nev., *Jepson.*

Refs.—ARGEMONE PLATYCERAS Link & Otto, Ic. Pl. Rar. 1:85, t. 43 (1828), type loc. Hacienda de la Laguna, Conf're de Perote, Mexico. Var. HISPIDA Prain, Jour. Bot. 33:367 (1895). *A. hispida* Gray, Mem. Am. Acad. ser. 2, 4:5 (1849), type loc. Santa Fe, N. Mex., *Fendler* 16 (in part). *A. munita* Dur. & Hilg. Jour. Acad. Phila. ser. 2, 3:37 (1855), type loc. Williamson Pass, *Heermann;* Pac. R. Rep. 5:5, t. 1 (1855).

2. **A. intermedia** Sweet var. **corymbosa** Eastw. PRICKLY POPPY. (Fig. 116.) Plants 1 to 3 feet high, prickly with stout yellow spines; leaves oblong to obovate or the upper ovate, repand-toothed to sinuate-pinnatifid; flowers fragrant, somewhat regularly corymbose; petals 10 to 14 lines (sometimes to 1½ inches) long; capsule ¾ inch long.

Mohave Desert. May-June.

Locs.—Nipton, e. Mohave Desert, *K. Brandegee;* Kelso, *K. Brandegee;* Ludlow, *Jepson* 5499; Blacks Ranch, se. of Fremont's Peak, *Hall & Chandler* 6848; Rabbit Sprs., *Jepson* 5945.

Refs.—ARGEMONE INTERMEDIA Sweet, Hort. Brit. ed. 2, 585 (1830), type from Mexico. Var. CORYMBOSA Eastw., Erythea 4:96 (1896). *A. corymbosa* Greene, Bull. Cal. Acad. 2:59 (1886), type loc. Mohave Desert, *Curran* in 1884; Parish, Bot. Gaz. 65:337 (1918).

5. **PAPAVER** L. POPPY

Erect herbs (ours annual) with narcotic juice. Leaves pinnately cleft, lobed or divided. Flowers showy, solitary on long peduncles, nodding in bud. Sepals 2. Petals 4, in ours red. Stamens very many. Ovary and capsule obovoid to subglobose, with 4 to many intruded placentae. Capsule opening by holes just below the summit.—Species about 50, mostly in Europe, Asia, and Africa, one in Australia, one (P. nudicaule L.) in boreal North America and south in the Rocky Mts. to New Mexico, and two in the Californias. (Latin name of the poppy.)

Juice milky; stigmas sessile and radiate upon the summit of the ovary.—Subgenus EUPAPAVER.
1. *P. californicum.*

Juice yellow; stigmas capitate upon the short slender style.—Subgenus MECONOPSIS.
2. *P. heterophyllum.*

Fig. 116. ARGEMONE INTERMEDIA Sweet var. CORYMBOSA Eastw. Black's Ranch, southeast of Fremont Peak, Mohave Desert. H. P. Chandler, photo.

1. **P. californicum** Gray. WESTERN POPPY. (Fig. 117.) Glabrous or sparsely pilose-pubescent, 1½ to 2 feet high; juice milky; leaves pinnately divided, the segments oblong or roundish, toothed, lobed, or incised; petals red with a green spot at base, 7 to 10 lines long; stigmas sessile and radiate upon the summit of the ovary, forming a sort of "skull cap," persistent in fruit; capsule turbinate-obovate, 6 to 7 lines long.

Fig. 117. PAPAVER CALIFORNICUM Gray; capsule, × 2.

Cismontane Southern California northward to Marin Co. Apr.-May.

Locs.—This species apparently occurs at but relatively few stations since it is infrequently collected. It is most common on burns the next year after a fire and on clearings. The following stations validate the indicated range: San Diego, *T. Brandegee;* Lakeside, San Diego Co., *T. Brandegee;* St. John's Cañon, s. of San Jacinto, *John Haslam;* San Dimas Cañon, San Gabriel Mts., *Peirson* 2397; Pasadena, *McClatchie;* Rattlesnake Cañon, Santa Barbara, *T. Brandegee;* San Marcos Pass, *T. Brandegee;* Santa Lucia Mts., *W. Vortriede;* Mt. Tamalpais, *Howe.*

Refs.—PAPAVER CALIFORNICUM Gray, Proc. Am. Acad. 22:313 (1887), type loc. Santa Inez Mts., *John Spence;* Jepson, Fl. W. Mid. Cal. 209 (1901). *P. lemmoni* Greene, Pitt. 1:168 (1888), type loc. Cholame Valley, San Luis Obispo Co., *Lemmon;* the "conical apiculation" is also more or less obvious in S. Cal. plants.

2. **P. heterophyllum** Greene. WIND POPPY. (Fig. 118.) Glabrous, 1½ to 2 feet high; juice yellow; leaves pinnate or pinnately divided, the segments entire, toothed or divided, exceedingly diverse in shape even on the same plant or the same leaf, varying from oval to narrowly linear; petals brick-red with a dark spot at base, broadly cuneate-obovate, ½ to 1 inch long; stigmas capitate at summit of a distinct and slender style; capsule clavate-obovoid, 4 to 7 lines long.

Hill slopes and valley fields: Coast Ranges from Lake Co. south to cismontane Southern California and Lower California; San Joaquin Valley; southern Sierra Nevada (Fresno Co. to Kern Co.). May.

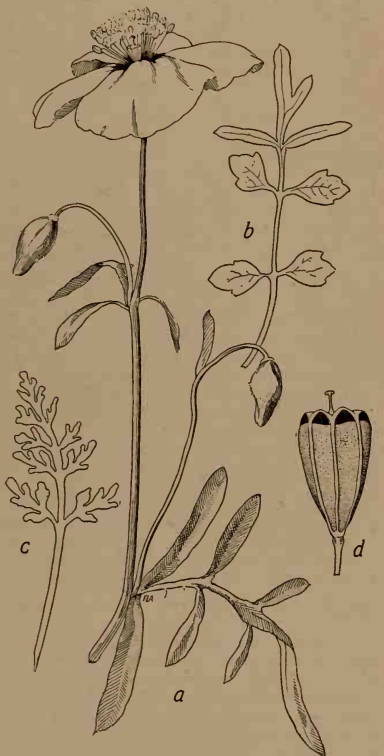

Fig. 118. PAPAVER HETEROPHYLLUM Greene. *a*, habit, × 1; *b*, *c*, different leaf types, × ½; *d*, capsule, × 2.

Tax. note.—The petals are a sort of brick red, or better a deep apricot color, something like the flesh of a Moorpark, with the light green very short claws bordered above by a small purple spot. The calyx often falls away as a sort of calyptra, instead of as two separate sepals.

Locs.—Tracy, *Bioletti;* Martinez, *Drew;* Mt. Diablo, *Brewer* 1001 (we found this to correspond excellently, especially in leaf character, with the Douglas type at Kew); Wild Cat Creek, Berkeley Hills, *Jepson;* Pt. Isabel, Contra Costa Co., *Davy;* San Mateo Creek, San Mateo Co., *Davy* 1080; Livermore, *Jepson;* Mt. Hamilton, *Heller* 7436; Santa Cruz Mts., *T. Brandegee;* Paso Robles, *Barber* A18; Alcalde, *T. Brandegee;* betw. Dunlap and Pinehurst, Fresno Co., *Newlon* 145; Kaweah, *Hopping* 82; Springville, Tulare Co., *Purpus* 1304; Greenhorn Range, *Hall & Babcock* 5024; San Emigdio foothills (Zoe 4:145); San Bernardino, *Parish;* Box Springs Mt., Riverside, *Geo. R. Hall;* San Diego, *T. Brandegee.*

Refs.—Papaver heterophyllum Greene, Pitt. 1:168 (1888); Jepson, Fl. W. Mid. Cal. 209 (1901). *Meconopsis heterophylla* Benth. Trans. Hort. Soc. Lond. ser. 2, 1:408 (1835), type grown from Cal. seed, *Douglas;* Hook. Ic. Pl. 8, t. 732 (1848); Brew. & Wats. Bot. Cal. 1:22 (1876). Var. crassifolium Jepson l.c. *Meconopsis crassifolia* Benth. l.c., type grown from Cal. seed, *Douglas,* a form with thicker leaves; the Douglas type at Kew we found to be almost exactly matched by a specimen from Tracy, San Joaquin Co. (Benj. Cobb.). *P. crassifolium* Greene, Man. Bay Reg. 9 (1894).

6. **ARCTOMECON** Torr. & Frem.

Herbs with a stout tap root. Leaves long-hirsute, crowded toward the base of the plant. Flowers large, white or yellow, solitary or in an umbelliform cluster. Sepals 2 or 3. Petals 4 or 6, round-obovate, in age persisting around the base of the capsule. Stamens numerous, short. Ovary and subcoriaceous capsule ovoid or obovoid, 3 to 6 (commonly 4)-valved; style shorter than the globular and lobulate mass of 3 to 6 erect and somewhat united stigmas. Seeds rather few, oblong.—Species 3, southwest United States. (Greek arctos, a bear, and mecon, poppy, from the hirsuteness.)

1. **A. merriamii** Cov. Desert Poppy. Plants 1 foot high, the stems somewhat branched near the base; herbage glaucous; leaves mostly basal, cuneate-flabelliform, petiolate, coarsely toothed at apex, hirsute with long brown hairs, 3 to 7½ lines long, the cauline shorter; flowers 1½ to 2 inches broad, solitary on long naked peduncles; sepals 3, villous; petals 6, white; filaments slender, slightly dilated upwards; stigmas sessile.

Eastern Inyo Co. East to southern Nevada. Apr.

Locs.—Ubeheba district, e. Inyo Co., *S. W. Austin* 437; Resting Springs Mine (Contrib. U. S. Nat. Herb. 4:59).

Refs.—Arctomecon merriamii Cov. Proc. Biol. Soc. Wash. 7:66 (1892), type loc. Vegas Ranch, Lincoln Co., Nev., *Merriam & Bailey;* Contrib. U. S. Nat. Herb. 4:59, pl. 2 (1893). This species in its tufted habit, in the shape, size, toothing and hairiness of its leaves and in the size and fundamental structure of its flower is remarkably like A. californicum Torr. & Frem. Both species have been little collected. The differences in inflorescence and color seem well established but other presumed differences need further examination.

A. californicum Torr. & Frem.; Frem. Rep. Sec. Exped. 312, t. 2 (1845), type loc. Las Vegas, s. Nev., *Fremont;* Gray, Proc. Am. Acad. 12:53, pl. 2 (1876). Not thus far collected in Cal.; peduncles leafy-bracted, several to many-flowered; petals yellow; stigma sessile.

7. **ROMNEYA** Harv.

Tall glabrous perennial from a soft woody base, with colorless bitter juice and alternate pinnatifid leaves. Corolla very large, bright white, with frilled petals. Stamens very numerous. Ovary and coriaceous capsule with 7 to 12 plate-like placentae, some of which meet in the axis and form partitions. Style none. Stigmas 7 to 12, partly coherent in a ring.—Species 1. (The astronomer, T. Romney Robinson of Dublin, friend of Dr. Thos. Coulter, the discoverer of the plant.)

1. **R. coulteri** Harv. Matilija Poppy. (Fig. 119.) Stems branching, leafy, 3 to 8 feet high; herbage glabrous, glaucescent; leaves petiolate, pinnately parted

or divided into 3 to 9 cuneate-oblong to lanceolate divisions or leaflets, these sparingly dentate or the terminal one 3-cleft, the margins and rachis often sparsely spinulose-ciliate; flowers short-peduncled, terminal, not drooping in bud, delicately fragrant, lasting a few days; calyx glabrous, somewhat beaked; corolla 3 to 5 inches broad; capsule ovate to oblong, 1½ inches long, strigose-hispid, the 7 to 12 valves opening from the summit downward; seeds slightly incurved with dull roughish coat.

Washes and cañon beds, 1000 to 2500 feet, cismontane Southern California from Santa Barbara Co. to San Diego Co. Lower California. May-June.

Biol. Note.—This species propagates by suckers and thus forms dense stools or heavy clumps. It is often cultivated as an ornamental plant and does well in warm valleys behind an outer coast ridge, as in the Santa Clara Valley at Los Altos where it is beginning to be spontaneous in orchards and may require special control.

Locs.—Temescal Wash, *Jepson* 1571; Corona, *Hall* 568; Santa Ana Cañon near Anaheim, *Parish;* San Diego, *Mary Spencer* 139. Var. **trichocalyx** Jepson n. comb. Calyx setose, beakless or nearly so.—Range of the species.

Refs.—ROMNEYA COULTERI Harv.; Hook. Lond. Jour. Bot. 4:75, t. 3 (1845), type from Cal., *Coulter.* Var. TRICHOCALYX Jepson. *R. trichocalyx* Eastw. Proc. Cal. Acad. ser. 3, 1:133 (1898), based primarily on cult. plants.

Fig. 119. ROMNEYA COULTERI Harv. *a*, flower; *b*, bud, × ½.

8. **DENDROMECON** Benth.

Glabrous evergreen shrub with alternate entire coriaceous leaves and golden yellow flowers. Sepals 2. Petals 4. Stamens numerous, with short filiform filaments and linear anthers. Style short, bearing 2 oblong stigmas. Capsule linear, curved, its two valves separating tardily or incompletely from the 2 thread-like placentae. Seeds pitted, provided with a caruncle.—Species 1. (Greek dendron, tree, and mecon, poppy.)

1. **D. rigida** Benth. BUSH POPPY. (Fig. 120.) Stems few to many from the base, 2 to 4 (or 8) feet high, the main stem bark shreddy; branches whitish; leaves yellowish green, oblong- to linear-lanceolate, reticulate, minutely denticulate, mucronate, 1 to 3½ inches long, borne on very short petioles which, by a twist, bring the blade vertical; flowers on peduncles 1 to 3 inches long; corolla 1 to 2½ inches in diameter; capsule 2 to 4 inches long.

Dry slopes and ridges at middle altitudes (1000 to 3000 feet): Coast Ranges; Sierra Nevada, north to Shasta Co. and southward to cismontane Southern California. May-June.

Ecol. Note.—The tap root is very stout, fleshy and brittle, and descends vertically for at least 3 to 5 feet. Regeneration takes place from the root crown, and there may be budding also from the roots, especially in areas of burned chaparral. A shrub in the Cajon Pass (*Jepson* 6110) showed flowers with 5 petals.

Locs.—Coast Ranges: Dunsmuir, *Jepson;* Mt. Tamalpais, *Jepson* 7453; Sommersville, Contra Costa Co., *Chesnut & Drew;* Mt. Diablo, *Jepson;* Moraga Ridge, *Jepson;* Santa Lucia Peak, *Jepson;* San Antonio Trail, Santa Lucia Mts., *Jepson.* Sierra Nevada: Yankee Hill, Columbia, *A. L. Grant* 669; Hazel Green to Bowers Cave, Mariposa Co., *Jepson;* Watson Spr., Sequoia Park, *Jepson.* Southern California: Rattlesnake Cañon, Santa Barbara, *Jepson* 9144; Ojai Valley, *Olive Thacher* 15; San Bernardino, *Parish;* Temecula Wash, *Jepson.*

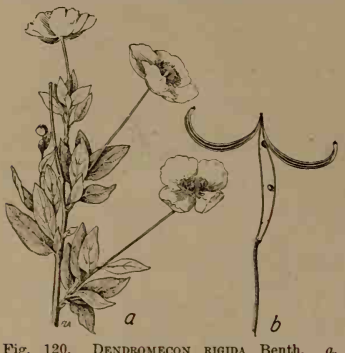

Fig. 120. DENDROMECON RIGIDA Benth. *a,* flowering branchlet; *b,* dehiscing capsule. × ½.

Var. **harfordii** K. Brandgee. Tree-like or shrubby, 6 to 10 (or 18) feet high, the branches more or less drooping; leaves elliptic, 1¼ to 5¼ inches long, entire, rarely minutely roughened.—Santa Barbara Isls.: Avalon, *Blanche Trask;* near Frey's Harbor, Santa Cruz Isl., *Frida Niedermüller;* Santa Rosa Isl., *Philip Mills Jones.*

Refs.—DENDROMECON RIGIDA Benth. Trans. Hort. Soc. ser. 2, 1:407 (1835), type grown from Cal. seed, *Douglas;* Jepson, Fl. W. Mid. Cal. 206 (1901). Var. HARFORDII K. Brandegee, Zoe 4:83 (1893). *D. harfordii* Kell., Proc. Cal. Acad. 5:102 (1873), type loc. Santa Rosa Isl., *W. G. Harford;* Trask, Erythea 7:145 (1899). *D. flexilis* Greene, Bull. Torr. Club 13:216 (1886), type loc. Santa Cruz Isl., *Greene.*

9. **ESCHSCHOLTZIA** Cham.

Annuals or perennials with watery juice, petioled ternately dissected leaves and peduncled yellow flowers. Receptacle hollowed or excavated, surrounding the base of the pistil, the calyx or corolla in consequence seeming as if perigynous; this receptacle (or torus) in addition often bears a spreading outer and an erect inner rim. Sepals completely united into a calyptra or pointed cap-like body which parts from the receptacle and is pushed off by the expanding petals. Stamens many, mostly on the base of the petals; anthers commonly longer than the filaments. Ovary linear; style very short; stigmas commonly 4, subulate-filiform, unequal. Capsule 1-celled, many-seeded, 2-valved.—Dehiscence of the capsule commonly occurs in flight, after the capsule parts from the receptacle and before it reaches the ground, usually beginning at the moment that the base of the capsule is released from the vise-like hollowed receptacle, this action allowing the valves which are elastically dehiscent from base to apex, to separate.—Species about 10. Oregon to New Mexico, California and northern Mexico. (Dr. J. F. Eschscholtz, college friend of Adelbert von Chamisso, German poet and naturalist, and his companion on Kotzebue's scientific voyage around the world.)

Cultural and field studies in Eschscholtzia.—Eschscholtzia is a genus which by the very unequal differentiation of its component species exhibits, like many other genera, very diverse specific values as they exist in nature. The true annuals consist of a number of species, which while not widely separated, are fairly constant in certain characters and recognizable as definite units of approximately equal status. The case is very different with the perennial forms. These comprise an aggregate, that is to say a central type with a number of more or less diverging forms, these diverging forms representing an endless complex of fluctuating and trivial variations in habit, vegetative organs, development of torus rim, form and size of calyptra, size and color of petals, number of stamens, number and relative size of stigmas, and rarely in the conditions of the cotyledons with respect to entirety, but all as now understood in the light of present investigations inevitably to be considered as a single species, since there are no two factors constantly associated. Examination and comparison of long series of specimens from the same locality and from different localities in all parts of California in connection with data derived from cultures and from experiments with hundreds of marked plants growing naturally prove satisfactorily that these variations may occur in endlessly varied and indefinite combinations.

The historic species is E. californica Cham., collected by Chamisso in the San Francisco sandhills in 1816. If a sandhill plant be followed through its flowering season, it exhibits in succession characters which have been used by two recent authors as differentiae for specific segregates. Much more striking are the results of field studies and experiments carried on during a period of eighteen years upon the form known as E. crocea Benth. This form reaches its highest development in the rich deep loams of interior valleys of California. When the rains break in October and November the plants develop tufts of leaves from the root-crown which continue to grow during the rainy season. In plants of a single colony and unquestionably of one species the foliage tufts exhibit severally various hues of green. In April these plants begin to flower. The flowering stems are stout, rigidly erect, leafy, or sometimes scapose, 1 to 2 feet high, bearing flowers with deep orange or copper-colored corollas 1½ to 2¼ inches long and exhibiting torus rims 1 to 2 lines wide (fig. 121). No other form equals this interior vernal one in size of corolla, width of torus rim, and gorgeousness of coloration. By the middle or end of April the rains cease, and as the weeks advance the successive flowering from the same individuals shows yellow-tipped petals or yellow corollas with a golden center. By the first or middle of May the summer heat of the rainless season begins, and the upright stalks cease to flower and begin to dry up. Their function is gradually assumed by stems from the same root-crowns, which give rise to the summer flowering. These stems are slender, ascending or diffuse, and bear flowers with straw-yellow corollas ½ to 1 inch long and torus rims ¼ to ½ line wide (fig. 122). Sometimes these same plants bear small golden corollas or more frequently yellow corollas with golden center. This flowering is characteristic of and continues through the arid or heat season until October. Hundreds of such plants growing in wild land have been carefully marked and connected with numbered iron stakes so that the individual could be positively identified in a succeeding month or season.

Fig. 121. ESCHSCHOLTZIA CALIFORNICA Cham. var. CROCEA Jepson. *E. crocea* Benth. This figure shows the habit of the plant at the vernal flowering stage in April. Observe the strictly erect stems, large corollas and broad torus rims. From this same root crown a crop of small flowers on slender diffuse stems is produced in summer and early fall. × ¼. Cf. Fig. 122. Also see p. 570.

Eschscholtzia californica is highly sensitive to rainfall, to humidity, to temperature and to the character of the soil. Individuals, for example, of the E. crocea form, after a given vernal flowering may not produce aestival flowers; sometimes the spring flowering of a given year represents the end of the reproductive period for that individual. On the other hand plants which have flowered during

the summer period may not flower at all the next spring, or the next year, just as vernal flowering plants of a given year may not flower the spring of the next year. Plants grown on the coast at Berkeley from seed of the E. crocea form do not, in such a situation, go through the successive life-history phases which characterize that form in the interior valleys, but tend to simulate closely the coastal form. Transplantation of perennial Eschscholtzias is difficult, but we have made in early winter successful transplants of the E. crocea form from Vaca Valley in the interior to Berkeley on the coast. These individual plants on flowering the next spring resembled, not their Vaca Valley associates, nor indeed their own previous flowering, but the smaller flowered and often somewhat scapose plants of the Berkeley Hills!

The Eschscholtzia crocea form furnishes a characteristic illustration of variation in the perennial group. In this form extreme types of habit and of flowers are produced on one root-crown during one season's reproductive period. Specimens from one locality representing these different phases, have been described by two authors as species, and specimens of the different phases from various localities have also been described by the same authors as species. Such proposals obviously cannot stand as species. Our work upon the E. crocea form alone is sufficient to destroy the value of the characters used as differentiae in the diagnoses of the numerous segregates of E. californica made by Greene and by Fedde, for the reason that the normal range of variation in the successive flowering stages of this one form covers all the characters used by these authors in describing their segregates.

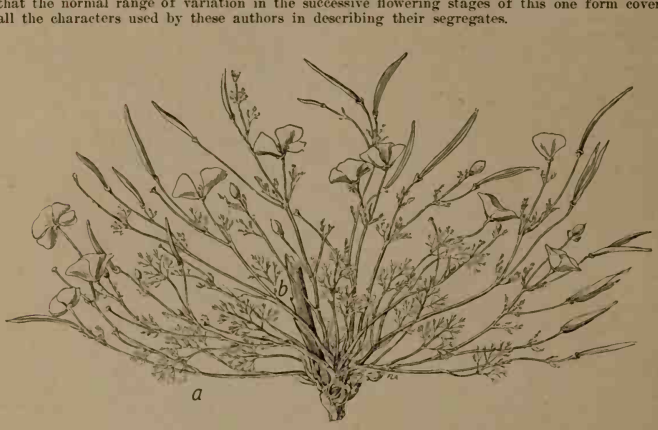

Fig. 122. ESCHSCHOLTZIA CALIFORNICA Cham. var. CROCEA Jepson (*E. crocea* Benth.); habit; summer-flowering (July) stage. These stems arise from the same root-crown that produced the erect large-flowered shoots shown in Fig. 121. A basal portion of one of the heavy erect flowering stems of spring, now dead and dry, is shown at *b*. × ¼.

Before going further it should be emphasized that the amount of variation in Eschscholtzia californica is not by any means as great as would naturally be supposed from the large number of specific segregates which have been published. Single sheets of Eschscholtzia specimens have been taken in the main by the segregators as *sui speciei*. If this method were generally employed it might be applied with similar results to hundreds of California species which have never been subject to segregation and which do not as yet possess a single synonym. We now proceed to a detailed analysis of the synonymy, although we regard the extent of our treatment as out of proportion to its intrinsic importance but not to its mass.

In Greene's Revision of Eschscholtzia (Pitt. 5:205–293) appear descriptions of 39 perennial species and 5 varieties, of which 32 species and all the varieties are new, 4 of the 7 remaining species having been fully described elsewhere by the same author. The annual species number 73 (or 1 a possible perennial) with 3 varieties, 56 of the species and the 3 varieties being new, 11 of the remaining 17 species having been previously described by Greene. Fedde in his account of Eschscholtzia (Engler, Pflzr. 4[108]:144–202) follows Greene and accepts his species, with the addition, however, of several new species and varieties, reducing only one of Greene's species to varietal rank.

The primary division of the key in each of the above-mentioned accounts rests upon size and character of the torus rim, number of stamens, and condition of cotyledons, with respect to entirety. Secondary distinguishing characters, as set forth in the key, are mainly those relating to longevity, and to the vegetative parts and the two outer floral whorls (the two inner floral whorls receiving but brief mention even in the diagnostic accounts). In the present treatment an effort has been made to determine anew the actual value of these characters (*a*) by comparison of a large number of herbarium specimens from the same locality and from different localities, (*b*) by comparison of specimens taken from marked plants at different times of the year, (*c*) by application of the diagnoses of Greene and Fedde to the specimens quoted by them wherever these specimens were available, and (*d*) by the results of garden cultures.

1. Torus rim.—Characters of the torus rim, which is a conspicuous structure in the perennials, are not satisfactory as differentiae, since this organ shows marked variation in size and form. In the following specimens the flowers show variation in width of torus rim as indicated: Dinsmores Ranch, opp. Buck Mt., Humboldt Co., *Tracy* 4138 (½ to 1 line wide); Pt. Isabel, Contra Costa Co., *Davy*, Apr., 1897 (½ to 1 line wide); Twin Peaks, San Francisco, *K. Brandegee* 14e (¾ to ½ line wide); Palo Alto, *C. F. Baker* 43 (¼ to ½ line wide); Riverside, *Hall* 3713 (¾ to 1¼ lines wide); Chinese Camp, *Jepson* 6316 (⅛ to ⅝ line wide). The same specimens serve to show the increase in width of torus rim which often occurs with age, the mature fruits showing rims of greater width than the buds or flowers. The great variation in width of torus rim at different seasons of the year as shown by marked plants in natural colonies proves also that this character is subject to seasonal variation: Vaca Valley, *Jepson* 4721, 5163. 6276, 6278, 6791, 6846. It is further to be pointed out that variations in the torus rim are simply those of degree and do not involve any morphologic change in structure. An examination of the descriptions of the torus in Greene's Revision of Eschscholtzia shows certain discrepancies between the species characters as set forth in the diagnoses and the species characters as set forth in the key. We note the heading in the key, "Outer margin of torus not obscure, etc." Under that heading we find certain species whose diagnoses contain a contrary or inconsistent statement as follows: *E. douglasii* Walp., "torus rim remarkably narrow and inconspicuous" (Pitt. 5:230); *E. shastensis* Greene, "torus exactly funnelform, the rim wholly inconspicuous, hardly surpassing the inner margin" (Pitt. 5:234); *E. diversiloba* Greene, "torus turbinate, its rim only small and insignificant" (Pitt. 5:256); *E. straminea* Greene, "torus very small, with rim greatly reduced, hardly more obvious than the inner margin" (Pitt. 5:257).

In the true annuals, however, the rimless torus is constant. The specimens we cite below under the several species verify this generalization.

2. Stamens.—In the great majority of perennial forms the number of stamens, about 24 to 44, is always indefinite. Greene's first key division is characterized by "Stamens mostly 40 or more." In certain specimens, unquestionably perennial and therefore belonging under this first division, flowers are found bearing fewer stamens (as few as 16 to 27): Simpsons Ranch, Sweetwater Creek, Eldorado Co., *K. Brandegee* 23c; Mt. Vision, Marin Co., *Hall* 8510; clay hills north of Ocean View, *K. Brandegee* 15e; sand hills at Pt. Pinos, Monterey Co., *Heller* 6539. Certain specimens whose basal portion has not been preserved, but whose broad torus rim should place them in the group having "stamens mostly 40 or more" according to Greene's Revision of Eschscholtzia, are found to have in some flowers as few as 17 to 27 stamens: Bodega Head, *K. Brandegee* 10e, 11e; Salinas River near Castroville, Monterey Co., *K. Brandegee* 12e, 13e.

Also the following unnoted discrepancies occur in the "Revision" itself, that is, certain species falling under the first division "stamens mostly 40 or more" are described as having stamens fewer than 40: *E. bicornuta* Greene, "stamens few" (Pitt. 5:249); *E. ambigua* Greene, "stamens about 12" (Pitt. 5:251); *E. vernalis* Greene, "stamens about 16" (Pitt. 5:259); *E. peninsularis* Greene, "stamens definitely 8" (Pitt. 5:360). Under the division "Stamens fewer, in some definitely 16, 12, 8 or even 4," occurs the species E. glyptosperma Greene. In this species we find as many as 27 stamens (Barstow, *K. Brandegee* 24e; Needles, *Ruby Warner*), a number greater than in any of the four segregates just noted which were included by Greene in his other section. Greene himself assigns "30 or more" stamens to this species (Pitt. 5:292). This character therefore does not by itself separate the genus into two distinct groups and is both too variable and too indefinite to be of real value.

3. Embryo.—Results obtained by the study of embryos as found in the seeds of a large number of herbarium specimens indicate that the condition of the cotyledons with respect to entirety, while not wholly invariable, is sufficiently so to render this character extremely valuable. From the following specimens, which are unquestionably perennial, data are obtained as recorded: Surf, *K. Brandegee* 7e (7 seeds examined, cotyledons all bifid); Surf, *K. Brandegee* 6e (10 seeds examined, 9 with cotyledons bifid, the remaining one with one cotyledon bifid, the other apparently entire); Seaside near Monterey, *K. Brandegee* 2e (6 seeds examined, cotyledons all bifid); Stanford, Santa Clara Co., *C. F. Baker* 174 (3 seeds examined, cotyledons

all bifid); Lake Merced, San Francisco, *Gardner* 526 (4 seeds examined, cotyledons bifid in 3, entire in 1); Presidio, San Francisco, *K. Brandegee* 20e (11 seeds examined, cotyledons bifid in 10, entire in 1); Twin Peaks, San Francisco, *K. Brandegee* 14e (9 seeds examined, cotyledons bifid in 8, entire in 1); Alma Soda Springs near the French settlement, Santa Clara Co., *Heller* 7501 = *E. granulata* Greene, Pitt. 5:235; *E. granulata* var. *minuscula* Fedde in Engler, Pflzr. 4^{100}:162 (9 seeds examined, cotyledons cleft in 5, entire in 4). On the other hand the members of the truly annual group are found to have entire cotyledons. Two to 4 seeds from many specimens were examined, these specimens being cited below under the species diagnoses and marked with an asterisk.

4. Longevity.—While all our Eschscholtzia forms fall into two distinct groups, annuals and perennials, the annual or perennial conditon taken alone is unsatisfactory as a character for practical use in classification, since the perennial forms flower the first year and their perennial nature is not at that time capable of proof. Moreover, particular individuals or colonies may, as a result of soil or seasonal conditions, perish the first year though potentially perennials under more favorable conditions. In the sum total of their characters they are allied to and belong with the perennial group. A very large number of diagnoses of so-called annual species have been drawn from single specimens which do not differ from the first-year form of known E. californica; they are therefore treated here as belonging to the perennial group. The perennial group, then, is commonly characterized by presence of a torus rim and by bifid cotyledons, while in the annual group the torus rim is absent and the cotyledons entire. Although these characters are not invariable in the perennial group they are sufficiently fundamental to be used in determining the primary sections of the genus.

Cotyledons 2-cleft; receptacle (torus) wth a collar-like rim; perennials (commonly flowering the first year) ..... 1. *E. californica.*

Cotyledons entire; receptacle (torus) without rim or with only a very narrow one; annuals.

Stems more or less leafy.

Petals 1 to 2⅔ lines long (longer in vars.); herbage usually glabrous; species of the Mohave and Colorado deserts ..... 2. *E. minutiflora.*

Petals about ½ to 1 inch long; cismontane species.

Herbage glabrous or nearly so.

Stems stout; leaves very finely cut; insular species ..... 3. *E. elegans.*

Stems slender; leaves not so finely cut; mainland species; var. hypecoides of 6. *E. caespitosa.*

Herbage hoary-pubescent with curled white hairs ..... 4. *E. lemmonii.*

Stems scapose, the leaves all in a low basal tuft or sometimes a few sub-basal.

Seeds strongly muricate with flattened processes, i.e. bur-like; leaf divisions long and rather few ..... 5. *E. lobbii.*

Seeds not muricate; leaf divisions numerous.

Seeds smooth or reticulate; leaves in a moderately dense tuft, the petiolcs unequal. 6. *E. caespitosa.*

Seeds with large deep rather remote pits; leaves in a very dense tuft, the petioles about equal ..... 7. *E. glyptosperma.*

1. **E. californica** Cham. California Poppy. Stems scapose or leafy, erect or diffuse, ¾ to 2 feet high; basal leaves ternately several times dissected into linear or oblong segments, on long or short petioles, the whole leaf ⅓ to 1 foot long; cauline smaller on short petioles; peduncles 2 or 3 to 6 inches long; petals fan-shaped, ½ to 2 inches long, varying from deep orange or copper-color to straw-color; outer spreading rim of the receptacle commonly ½ to 2 lines wide, the inner erect rim hyaline; capsule 1 to 3 or even 4 inches long.

Throughout cismontane California in the valleys and foothills, 10 to 2000 feet. Widely naturalized in Australia and India.

Note on Variability.—Fluctuating variability is so general and so wide-spread in Eschscholtzia californica that it is difficult to present an adequate account of it, but the following synopsis will help to give some hints of its extent and character.

1. Habit and leafiness.—The typical sand dune form is low and cespitose in habit, with thickened often multicipital caudex from which arises a cluster of small short-petioled leaves with short rather broad segments, and 1 to several short leafy (or mostly leafless and scapose) stems terminated by disproportionately large flowers: San Francisco, *Bioletti* in 1891; Twin Peaks, San Francisco, *K. Brandegee* 14e; clay hills north of Ocean View, *K. Brandegee* 15e; Lake Merced, San Francisco, *Gardner* 530. The following spms. from localities other than the type locality are essentially typical: Mt. Vision, Marin Co., *Hall* 8510; Oakland Hills, *Jepson* 6821; Pacific Grove, *Chandler* 320; Jolon, Monterey Co., *K. Brandegee* 20e; San Bernardino Valley, *Jepson* 5549; Beaumont, *Jepson* 6077; Warner Ranch, San Diego Co., *T. Brandegee.* There are continuous intergrades (Marine Hospital, San Francisco, *Heller* 6624) to plants with leafy stems and non-cespitose habit: Mt. Tamalpais, *K. Brandegee* 37e; Presidio, San Francisco, *C. F. Baker* 700; San Francisco, *C. F. Baker* 2999; Lake Merced, San

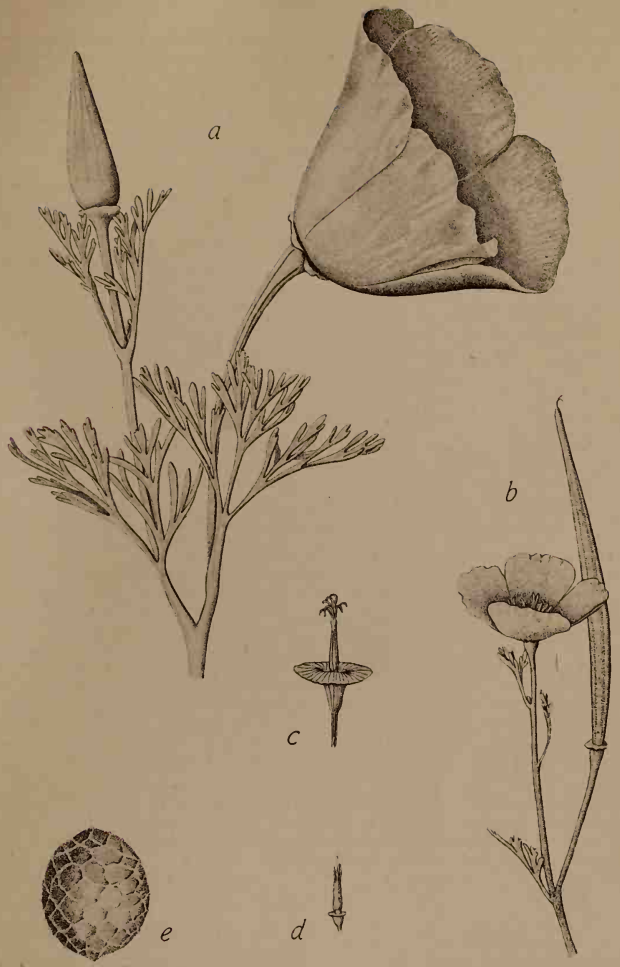

Fig. 123. ESCHSCHOLTZIA CALIFORNICA Cham. var. CROCEA Jepson. The flowering branchlet *a* represents the average size of the large bronze-gold corollas of the spring flowering (Mar.-Apr.); these flowers are borne on stout erect stems. The flowering branchlet *b* was taken from the same root-crown as *a;* it represents the average size of the straw-yellow corollas of the summer and autumn flowering; such flowers are borne on slender diffuse stems. *c* is a detail of *a,* showing the characteristic broad torus rim of the spring flowering; *d* is a detail of *b,* showing the narrow torus rim of the summer flowering. Plants in full vigor which produce a crop of large flowers in spring produce also from the same root-crowns a regular crop of small summer flowers. *a, b, c, d,* × 1; *e,* seed, × 12.

Francisco, *Gardner* 526–531. These latter pass gradually into the form having erect branching leafy stems 1 to 1½ feet high with large golden yellow flowers (Lake Merced, San Francisco, *Gardner* 17c), which is indistinguishable from and culminates in the var. crocca, the common form further inland. In such a series there is no break and neither is any one character constantly associated with any other character. In some cases the stems are somewhat slender and ascending and but few in number (Cow Creek, Shasta Co., *Baker & Nutting* in 1894; Del Monte, Monterey Co., *Elmer* 3551), while in other cases they are stouter and stiffly erect, and numerous (near Walker Mt., Mendocino Co., *Davy* 1028 = var. crocea; near Copperopolis, Calaveras Co., *Davy* 1396 = var. crocea); the root, while often thickened above may lose its multicipital character (Cow Creek, Shasta Co., *Baker & Nutting* in 1894; Smith Sta., Yosemite Park, *Evans* 1; Poso Creek, Kern Co., *Hall & Babcock* 5008); the basal and often the cauline leaves may have long slender petioles and narrow elongated segments and the flowers long peduncles (Reche Cañon, San Bernardino, *Parish* 5607).

2. Glaucescence and pubescence.—Certain of the coast forms are not at all glaucescent (Pt. Isabel, Contra Costa Co., *Davy*, Apr. 1897; Alton, Humboldt Co., *Tracy* 3765). In other forms this character is sparingly evident (clay hills north of Ocean View, *K. Brandegee* 15e; Twin Peaks, San Francisco, *K. Brandegee* 14e; creek north of Mill Creek, Santa Lucia Mts., *Jepson* 2610); while the extreme is reached in the insular and mainland coast form, var. maritima Jepson (Surf, Santa Barbara Co., *K. Brandegee* 6e, 7e, 8e; Pt. Pinos, Monterey Co., *Heller* 6539; Seaside near Monterey, *K. Brandegee* 2e, 3e). Pubescence, if present at all, is itself variable in character, being rather fine in certain plants which answer to *E. foeniculacea* Greene (Salinas River near Castroville, *K. Brandegee* 12e, 13e) and of a scabrous nature in var. maritima Jepson (Surf, Santa Barbara Co., *K. Brandegee*, 8e, 9e).

3. Calyptra.—In typical E. californica (as figured by Chamisso) the calyptra is ovoid-conical, 7 lines long, with a stout blunt beak about 2 lines long. From this form, however, there is every intergrade to long slender beaks or short thick ones or even to nearly beakless calyptras. Even in one collection or even on one individual there are frequently found beaked and beakless calyptras: clay hills north of Ocean View, *K. Brandegee* 15e; Mt. Tamalpais, *K. Brandegee* 37e; Gold Run, Placer Co., *K. Brandegee* 38e; Tehachapi, *K. Brandegee* 39e.

4. Corolla.—In typical E. californica (as figured by Chamisso) the obovoid petals are 14 lines long. Specimens from the type locality vary considerably, the corolla in some plants being scarcely more than ½ inch long (Twin Peaks, San Francisco, *K. Brandegee* 14e), while in others it is 1½ to 1¾ inches long (San Francisco, *Bioletti* in 1891). The seasonal variation in size and color of the corolla in the var. crocea has been referred to above.

There is likewise a wide range of variation in color in plants from the type region of E. californica Cham. Plants with flowers of a very deep orange color are frequently found (clay hills north of Ocean View, *K. Brandegee* 15e; Lake Merced, San Francisco, *K. Brandegee* 17e), while plants of the following series by Gardner are alike not merely in technical characters but in habit and size, as alike indeed as if taken from the same root, and yet show the following color variation: vicinity of Lake Merced, San Francisco, *Gardner* 525, "petals clear light yellow, no evidence of orange"; 526, "clear light yellow except for orange spot in claw"; 527, "clear light yellow with definite deep orange blotch on lower third of each petal"; 528, "petals, lower half deep orange, upper half light yellow"; 529, "petals deep orange except for narrow fringe of light yellow"; and 531, "petals deep orange throughout." In occasional instances the petals are yellow tinged with red: Presidio (serpentine outcrop), San Francisco, *K. Brandegee*, May-June, 1908; Berkeley, *H. A. Walker* 201, *Jepson* June 21, 1905. In form and in number the petals are fairly constant, but there is occasionally a strong tendency to variation: Simpson's Ranch, Sweetwater Creek, Eldorado Co., *K. Brandegee*, June 1, 1908, "locality about 15 × 20 m., plants in close proximity" (petals truncate or rounded, entire or erose or with an abrupt tooth or scallop at tip, in some cases numbering 6, the inner 3 narrower than the outer); Sonoma Valley, *Jepson* 4188 (corolla often 6-merous).

5. Pistil.—The characters of the stigmas are scarcely used in either Greene's or Fedde's key as forming any part of their basis for distinguishing species, although *E. xylorrhiza* Greene, *E. scariosa* Greene, *E. gigas* Fedde and *E. chartacea* Fedde are described as having respectively 2, 8 or 10, many (12?), and 3 (or 6?) stigmas. In most of the other segregates the stigmas, if mentioned at all, are said to be "4 and unequal." The examination of herbarium material shows that there is a tendency toward variation from 4 stigmas but that this variation is not correlated with any other character: Presidio, San Francisco, *K. Brandegee* 20e, "styles 2–4 on same plant"; Berkeley (about vacant lots, Oxford and Center sts.), *K. Brandegee*, Nov., 1917; Grouse Creek, Humblodt Co., *Chesnut & Drew*, Aug. 1, 1888; New York Ravine, Eldorado Co., *K. Brandegee*, June, 1908; Parkfield, se. Monterey Co., *K. Brandegee*, May 12, 1916.

To sum up we find frequent evidence of fluctuating variability in a single collection or even on a single plant, examples of it being apparently as widespread as the species. It is conceivable and indeed probable that the descriptions of the segregates of Greene and of Fedde noted above, in each case resting upon a single specimen, may be but examples of inconstant variation.

The various lines of variation which we have discussed culminate in a few cases in strongly marked forms which for the sake of convenience are here described as if definite varieties although they represent only termini.

Var. **crocea** Jepson n. comb. (Figs. 121, 122, 123.) In its most marked form this variety passes normally through two seasonal flowering stages. (*a*) Vernal stage: stems commonly many from the crown of a thick deep-seated root, mostly stiffly erect, 1 to 1½ (or 2) feet high; herbage glaucous; stems leafy, or, in the ante-flowering stage, leaves in a basal tuft; flowers 1 or mostly 1½ to 2¼ inches long; buds 8 to 18 lines long, long-pointed; torus rim 1 to 2 lines broad; petals a deep rich orange; pods 2 to 3 inches long. (*b*) Aestival stage: stems fewer, diffuse, spreading or decumbent, ½ to 1 (or 1½) feet long, more or less branched, leafy; flowers ¼ to ½ (or 1) inch long; buds 2 to 3 lines long, apiculate; torus rim ⅛ to ¼ line broad; petals pale or straw-yellow; pods 1 to 1½ inches long.—Interior valleys, particularly the Sacramento and San Joaquin, reaching its highest development and most marked differentiation into two distinct flowering stages, vernal and aestival, when in rich alluvial loams. The above diagnosis of these two flowering stages is based primarily upon marked plants growing naturally in Vaca Valley (*Jepson* 4176, 4178, 4721, 6276, 6278, 6846).

Locs.—The specimens cited are referred here chiefly on the basis of morphological character. Coast Ranges: Scott Bar to Scott Valley, Siskiyou Co., *Jepson* 2956 (aestival); Horseshoe Bend, upper Sacramento River, *Jepson;* Bucksport, Humboldt Co., *Tracy* 3210 (vernal), 2118 (aestival); Hydesville, Humboldt Co., *Tracy* 3600; Walker Mt., Mendocino Co., *Davy & Blasdale* 1028 (vernal); Willits, *Jepson* 2501; Blue Lakes, Lake Co., *Jepson;* Coyote Valley, Lake Co., *Jepson;* Howell Mt., *Jepson* 2442 (aestival); Napa Valley, *Sonne* (vernal); Sonoma Valley, *Jepson* 4188 (vernal); Eldredge, Sonoma Co., *Jepson* 5800 (vernal); Vacaville, *Jepson* 4174, 4175, 4721, 5163, 6846 (aestival), and 4176, 4178, 4179, 4180, 6276, 6278, 6791 (vernal); Cordelia, Solano Co., *Jepson* 3080, 3083 (aestival); San Ramon Valley, *Jepson* 2643; San Leandro, *Jepson* 5299 (small-flowered, vernal); Niles, *Jepson* 2471 (vernal); Los Gatos, *Heller* 7285 (vernal) = *E. revoluta* Greene var. *caudatocalyx* Fedde in Engler, Pflzr. 4[104]:172; Waltham Creek, San Carlos Range, *Jepson* 2657. Sierra Nevada: Upper Fall River Valley, *Jepson* 5767; Stillwater, Shasta Co., *Baker & Nutting* (aestival); Beckwith Pass, *Jepson* 7774; Indian Valley, Plumas Co., *Hall & Babcock* 4430 (aestival) = *E. shastensis* Greene acc. Fedde in Engler, Pflzr. 4[104]:161; Chinese Camp, *Jepson* 6316; Wawona, *Hall* 9001 (aestival); Caliente, Kern Co., *Jepson* 6746 (leaf-segments broad and few); Keene, Tehachapi Mts., *Jepson* 7187. Great Valley: Marysville Buttes, *Jepson;* Clements, San Joaquin Co., *Jepson* 1821. Southern California: Beaumont, Riverside Co., *Jepson* 6077, *Hall* 5753 (vernal) = *E. sanctarum* Greene acc. Fedde in Engler, Pflzr. 4[104]:168.

Var. **maritima** Jepson n. comb. Stems leafy, early ascending, later becoming prostrate, ½ to 1 foot long; herbage very glaucous, glabrous or minutely scaberulous or the pubescence often scurf-like; leaves with short crowded segments; calyptra of bud short-oblong, 4 to 5½ lines long, abruptly narrowed to a blunt or beaked apex; petals ¾ inch long, lemon yellow with an orange spot at base; pod 1½ to 2 inches long; seeds nearly smooth.—San Miguel Isl. and coast of Santa Barbara Co., north to Monterey Co. June-Sept.

Locs.—San Miguel Isl., *Greene* in 1887 (cult. at Berkeley from San Miguel seed); San Luis Obispo Co., *Summers,* June 17, 1884; Surf, Santa Barbara Co., *K. Brandegee* 5e, 6e, 7e, 8e, 9e; Pacific Grove, *Tidestrom,* June 6, 1893, *Chandler* 320; Seaside, Monterey Co., *K. Brandegee* 1e, 2e, 3e, 4e.

Var. **stricta** Jepson n. comb. Stems slender, branched, many from a branched taproot, ½ to 1 foot high; herbage glaucous, glabrous except for the scabrous-ciliolate petioles and petiolules; torus rim narrow, the inner margin of almost equal width; petals 3 lines long; stigmas 4 (or 2?); cotyledons bifid.—Snow Mt., Lake Co., *K. Brandegee,* Aug. 25, 1892 and June 22, 1891. Not at all well known and dubiously given varietal rank until better material is collected.

Other spms. before us, representing mostly slight departures from typical E. californica, but treated by Greene or Fedde as distinct from it are: San Diego, *Hall* 3975 (*E. clevelandii* Greene acc. Fedde in Engler, Pflzr. 4[104]:173); Foster, San Diego Co., *Hall* 3873 (*E. vernalis* Greene acc. Fedde l.c. 180); San Diego, *C. F. Baker* 3387 (*E. clevelandii* Greene acc. Fedde l.c. 173); Riverside, *Hall* 3826 and 3713, also Moreno Valley, Riverside Co., *Hall* 3849 (*E. picta* Greene acc. Fedde l.c. 178); San Bernardino, *Parish* 4162 (*E. bernardina* Greene, Pitt. 5:255); San Bernardino, *Parish* 5770 (*E. picta* Greene acc. Fedde l.c.); City Creek, San Bernardino Mts., *Parish* 5722 (*E. straminea* Greene acc. Fedde l.c. 179); Reche Cañon, San Bernardino Co., *Parish* 5607 (*E. rigida* Greene acc. Fedde l.c. 170); Elysian Park, Los Angeles, *Braunton* 834 (*E. picta* Greene acc. Fedde l.c. 178); Palmdale, Antelope Valley, *Hall* 3046 (*E. picta* Greene acc. Fedde l.c.); Lockwood Valley, Mt. Pinos, Ventura Co., *Hall* 6441 (*E. absinthiifolia* Greene acc. Fedde l.c. 166); Santa Rosa Isl., *T. Brandegee,* June, 1888 (*E. robusta* Greene, Pitt. 5:266); Santa Cruz Isl., *Greene* in 1886 (*E. glauca* Greene, l.c. 266); Santa Barbara, *Bingham* in 1886 (*E. leptomitra* Greene, l.c. 265); Pt. Pinos, Monterey Co., *Heller* 6539 (*E. menziesiana* var. *coarctata* Fedde, Rep. Nov. Sp. 2:147); Pacific Grove, *Heller* 6638, 6860 (*E. helleriana*

Greene acc. Fedde in Engler, Pflzr. 4^{104}:160); Palo Alto, *C. F. Baker* 43 (*E. juncea* Greene acc. Fedde l.c. 158), late aestival form; Stanford, *C. F. Baker* 660 (*E. recta* Greene acc. Fedde l.c. 171); Stanford, *C. F. Baker* 174 (*E. granulata* Greene l.c. 235); above Alma Soda Springs near the French Settlement, Santa Clara Co., *Heller* 7501 (*E. granulata* Greene l.c.; *E. granulata* var. *minuscula* Fedde, Rep. Nov. Sp. 2:147), the spm. with cotyledons entire in some seeds, cleft in others; Tracy, *C. F. Baker* 2778 (*E. arvensis* Greene l.c. 253); Tracy, *C. F. Baker* 2906 (*E. arvensis* Greene acc. Fedde in Engler, Pflzr. 4^{104}:176); Berkeley, *Hall* 1091a (*E. revoluta* Greene acc. Fedde l.c. 172); Lake Merced, San Francisco, *Gardner* 526 (*E. pseudoinflata* Fedde, Rep. Nov. Sp. 3:75); Bodega Point, Sonoma Co., *Eastwood*, June 9, 1899 (*E. cucullata* Greene acc. Fedde in Engler, Pflzr. 4^{104}:157); Knoxville, Napa Co., *C. F. Baker* 2969 (doubtless a duplicate of Greene's type of *E. marcida* Greene l.c. 233); Kelseyville, Lake Co., *C. F. Baker* 3088 (*E. apiculata* Greene l.c. 235); Klamathon, Siskiyou Co., *Copeland* 3532 (*E. confinis* Greene l.c. 237); Shasta Valley, Siskiyou Co., *Hall & Babcock* 4082 (*E. confinis* Greene acc. Fedde l.c. 163); Fall River Sprs., Shasta Co., *Hall & Babcock* 4173 (*E. shastensis* Greene acc. Fedde l.c. 161); Cow Creek, Shasta Co., *Baker & Nutting* in 1894 (*E. recta* Greene l.c. 245); Amedee, Lassen Co., *Davy* in 1897 (*E. yainacensis* var. *modocensis* Fedde, Rep. Nov. Sp. 3:28); Mountain Sprs., Amador Co., *Hansen* 1059, and Irishtown, Amador Co., *Hansen* 1112 (*E. recta* Greene acc. Fedde in Engler, Pflzr. 4^{104}:171); Smith Sta., Yosemite Park, *H. M. Evans* 1(*E. bioletti* Greene acc. Fedde l.c. 159); Madera, *Setchell*, Apr. 22, 1897 (*E. setchellii* Fedde, Rep. Nov. Sp. 3:183); Tulare, *Davy* 3101 (*E. inflata* Greene acc. Fedde in Engler, Pflzr. 4^{104}:183); Poso Creek, Greenhorn Range, Kern Co., *Hall & Babcock* 5008 (*E. recta* Greene acc. Fedde l.c. 171).

Teratology.—The plasticity of Eschscholtzia californica is evidenced by the number of cases of extreme variation or of abnormal structures which are reported each year. The corolla is sometimes 6-merous (Sonoma Valley, *Jepson* 4188) or with an inner whorl of linear petals (Berkeley, *Gray*); cf. also Erythea 7:81. Flowers with 1 or more slashed or lobed petals are often seen (Berkeley, *Pearl Edgerly, K. Brandegee*; Lake Merced, San Francisco, *K. Brandegee*). The stigmas are sometimes multiplied, becoming as many as 31 (San Francisco, *K. Brandegee*). Fasciated plants are reported nearly every year; these usually conform to one type—the whole of the stem parts being condensed into a single strap-shaped structure 8 to 12 inches high and 1½ inches wide, the summit bearing a monstrous flower, or sometimes with secondary fasciations bearing flowers (Stockton, *Audrey Lambourne;* cf. also Erythea 2:14 and 7:81).

Refs.—Eschscholtzia californica Cham. in Nees, Hor. Phys. Ber. 73, t. 15 (1820), type loc. dry sterile sand, San Francisco, *Chamisso;* Fedde in Engler, Pflzr. 4^{104}:154, fig. 21^{1} (1909); var. *luxurians* Fedde, Rep. Nov. Sp. 3:27 (1906), type loc. Marine Hospital, San Francisco, *Heller* 6624. *E. absinthiifolia* Greene, Pitt. 5:239 (1905), type loc. Ventura Co., *Elmer* in 1902; Fedde in Engler, Pflzr. 4^{104}:166, fig. 22^{6} (1909). *E. ambigua* Greene, Fl. Fr. 286 (1892), type loc. Cholame, San Luis Obispo Co., *Lemmon;* Fedde l. c. 175, fig. 23^{4} (annual form). *E. angularis* Greene, Pitt. 5:238 (1905), type loc. Round Valley, Mendocino Co., *Chesnut* in 1897 and 1898; Fedde l.c. 164, fig. 22^{5}. *E. apiculata* Greene l.c. 235, type loc. Kelseyville, Lake Co., *C. F. Baker* 3088; Fedde l.c. 162, fig. 21^{18} (1909). *E. arvensis* Greene l.c. 253, type loc. Tracy, *C. F. Baker* 2778; Fedde l.c. 176, fig. 23^{3}; var. *dilatata* Greene l.c. type loc. Lathrop, *Greene*, Apr. 29, 1889 (annual form); var. *orthodichasialis* Fedde, Rep. Nov. Sp. 3:105 (1906) based on a garden spm. from Berkeley, *Hall* 3700. *E. benedicta* Greene l.c. 228, type locs. Lewis Creek, San Benito Co., and Cantua Creek, Fresno Co., *Eastwood*, May, 1893; Fedde in Engler, Pflzr. 4^{104}:158, fig. 21^{8}. *E. bernardina* Greene l.c. 255, type loc. Edgar Cañon, San Bernardino Mts., *Parish* 3139; Fedde l.c. 178, fig. 23^{5} (annual form); var. *coarctata* Fedde, Rep. Nov. Sp. 3:183 (1906), type loc. San Bernardino, *S. B. & W. F. Parish* 130. *E. bioletti* Greene l.c. 232, type loc. Hetch Hetchy, June, 1900, *Bioletti*. *E. brandegei* Greene l.c. 248, type loc. Lakeport, *Brandegee*, Apr., 1889; Fedde in Engler, Pflzr. 4^{104}:173, fig. 22^{22}. *E. calosperma* Greene l.c. 246, type loc. between Kings City and Jolon, Monterey Co., *Eastwood*, June 7, 1893. *E. chartacea* Fedde in Rep. Nov. Sp. 3:105 (1906), type loc. Colusa Co., *Brandegee*, Apr., 1889. *E. clevelandi* Greene l.c. 248, type loc. San Diego, *Eastwood;* Fedde in Engler, Pflzr. 4^{104}:173, fig. 22^{23} (1909). *E. cognata* Greene l.c. 252, type loc. Colusa Co., *T. Brandegee*, Apr., 1889 (annual form). *E. columbiana* Greene l.c. 231, type loc. lower Columbia River region, Wash. and Ore., *Suksdorf* in 1881; Fedde l.c. 159, fig. 21^{13} (1909). *E. compacta* Walp. Rep. 1:116 (1842). *Chryseis compacta* Lindl. Bot. Reg. t. 1948 (1837), type from the w. coast of N. Am. *Eschscholtzia confinis* Greene l.c. 237, type loc. Klamathon, *Copeland*, July 2, 1903; Fedde l.c. 163, fig. 22^{2}. *E. cucullata* Greene, Erythea 2:120 (1894), type loc. Ft. Bragg, Mendocino Co., *Michener* in 1893; Fedde l.c. 157, fig. 21^{5}. *E. cyathifera* Greene, Pitt. 5:263 (1905), type loc. Alcalde, Fresno Co., *T. Brandegee*. *E. debilis* Greene l.c. 227 (1905), type loc. Russian River sta., Sonoma Co., *Newell*, Aug., 1900. *E. diversiloba* Greene l.c. 256, type loc. Lakeport, *Brandegee*, Apr., 1889 (annual form). *E. douglasii* Walp. Rep. 1:116 (1842); Fedde l.c. 160, fig. 21^{12}. *Chryseis douglasii* H. & A. Bot. Beech. 320 (1840), type from Ore., *Douglas;* T. & G. Fl. 1:664 (1840). *E. eastwoodiae* Greene l.c. 227 (1905), type loc. Sequoia Mills, Fresno Co., *Eastwood*, May, 1893; Fedde l.c. 158, fig. 21^{7}.

E. foeniculacea Greene l.c. 224, type loc. Monterey and Castroville to La Honda, *T. & K. Brandegee*, Apr., 1889; Fedde l.c. 156, fig. 21[4]. *E. floribunda* Greene l.c. 247, type loc. Santa Ysabel, *Henshaw*, May 15, 1893; Fedde l.c. 172, fig. 22[19]; var. *gorgonica* Greene l.c., type loc. San Gorgonio Pass, *Leiberg*, Apr. 5, 1898; Fedde l.c. 173, fig. 22[20]; var. *gracillima* Fedde in Rep. Nov. Sp. 3:105 (1906), type loc. Wildomar, Riverside Co., *Hall* 385; Fedde in Engler, Pflzr. 4[104]:173; fig. 22[21] (1909). *E. glauca* Greene, Pitt. 1:45 (1887), type loc. Santa Cruz Isl.; Fedde l.c. 157, fig. 21[5]. *E. granulata* Greene, Pitt. 5:235 (1905), type loc. Stanford University, *C. F. Baker* 174; Fedde l.c. 162, fig. 21[19]; var. *minuscula* Fedde in Rep. Nov. Sp. 2:147 (1906), type loc. Alma Soda Spr. near the French Settlement, Santa Clara Co., *Heller* 7501. *E. helleriana* Greene l.c. 229, type loc. Monterey, *Heller* 6860; Fedde in Engler, Pflzr. 4[104]:160, fig. 21[11] (1909); var. *tilingii* Fedde, Rep. Nov. Sp. 3:27 (1906), type loc. San Francisco, *Tiling*, 1874. *E. inflata* Greene l.c. 264, type loc. Goshen, Tulare Co., *T. Brandegee*, Apr. 2, 1891 (annual form); Fedde, in Engler, Pflzr. 183, fig. 23[8] (1909). *E. isostigma* Greene l.c. 254, type loc. Montezuma Hills, *Jepson* in 1892 (annual form). *E. juncea* Greene l.c. 228, type loc. Santa Cruz Mts., *Parry* in 1888; Fedde l.c. 158, fig. 21[8] (1909). *E. lacera* Greene l.c. 250, type loc. Kernville, *Palmer;* Fedde l.c. 175, fig. 22[28] (annual form). *E. leptandra* Greene, Pitt. 1:170 (1888), type loc. Verdi, Nev., *Sonne;* Fedde l.c. 163, fig. 22[1]. *E. leptomitra* Greene, Pitt. 5:265 (1905), type loc. Santa Barbara, *Bingham* in 1886. *E. leucosticta* Greene l.c. 229, type loc. Ben Lomond, Santa Cruz Co., *T. Brandegee* in June, 1889; Fedde l.c. 158, fig. 21[10]. *E. macrantha* Greene l.c. 242, type loc. Visalia, *Patterson;* Fedde l.c. 168, fig. 22[20]. *E. marcida* Greene l.c. 233, type loc. Knoxville, Napa Co., *C. F. Baker;* Fedde l.c. 160, fig. 21[14]; var. *monticola* Greene l.c. type loc. Santa Lucia Mts., Monterey Co., *Eastwood;* Fedde l.c. fig. 21[15]. *E. menziesiana* Greene l.c. 223, type loc. Pt. Pinos, Monterey, *Greene;* Fedde l.c. 155, fig. 21[3] (1909); var. *reedens* Greene l.c. type loc. Pt. Pinos, Monterey; var. *anemophila* Greene l.c. type loc. Pt. Sur, *T. Brandegee;* var. *coaretata* Fedde, Rep. Nov. Sp. 2:148 (1906), type loc. Pt. Pinos, Monterey, *Heller* 6539; var. *nesiaca* Fedde l.c. type loc. Santa Cruz Isl., *Brandegee*, 1888. *E. microloba* Greene l.c. 250, type loc. Carrizo Plains, *Eastwood*, June 12, 1902; Fedde in Engler, Pflzr. 4[104]:174, fig. 22[23] (annual form). *E. nitrophila* Greene l.c. 240, type loc. Bear Valley, San Bernardino Mts., *Parish;* Fedde l.c. 166, fig. 22[7]. *E. physodes* Greene l.c. 259, type loc. Witch Creek, San Diego Co., *Alderson* (placed here with doubt as no spms. seen). *E. picta* Greene l.c. 255, type loc. San Francisquito Cañon, Los Angeles Co., *Parish;* Fedde l.c. 178, fig. 23[4] (annual form). *E. procera* Greene l.c. 241, type loc. Kernville, *T. Brandegee*. *E. pseudoinflata* Fedde, Rep. Nov. Sp. 3:75 (1906), type loc. Lake Merced, San Francisco, *Gardner* 526. *E. recta* Greene l.c. 245, type loc. Elmira, *Baker* 2921; Fedde in Engler, Pflzr. 4[104]:171, fig. 22[18]. *E. revoluta* Greene l.c. 247, type loc. Livermore Valley, *Greene*, Apr. 3, 1895; Fedde l.c. 172, fig. 22[17]; var. *caudatocalyx* Fedde in Rep. Nov. Sp. 3:105 (1906), type loc. Niles, *Hall* 1637; Fedde in Engler, Pflzr. 4[104]:172, fig. 22[18]. *E. rigida* Greene l.c. 244, type loc. Tehachapi, *Greene;* Fedde l.c. 170, fig. 22[16]. *E. robusta* Greene l.c. 266, type loc. Santa Rosa Isl., *T. Brandegee;* Fedde l.c. 185, fig. 23[11] (annual form). *E. sanctarum* Greene l.c. 243, type loc. Mesa Grande, San Diego Co.; Fedde l.c. 168, fig. 22[11]. *E. scariosa* Greene l.c. type loc. Carrizo Plains, *Eastwood;* Fedde l.c. 169, fig. 22[13]; var. *dichasiophora* Fedde, Rep. Nov. Sp. 3:75 (1906), type loc. Cuyama, Caliente Creek, San Luis Obispo Co., *Eastwood*. *E. setchellii* Fedde in Engler, Pflzr. 4[104]:183, type loc. Madera, *Setchell* (annual form). *E. shastensis* Greene l.c. 234, type loc. Stillwater, Shasta Co., *Baker & Nutting*, May 21, 1894; Fedde l.c. 161, fig. 21[13] (1909). *E. straminea* Greene l.c. 257, type loc. San Bernardino Mts., *Parish;* Fedde l.c. 179, fig. 23[4] (annual form). *E. tenuiseeta* Greene, Pitt. 1:169 (1888), type loc. Chico, *Parry;* Fedde l.c. 176, fig. 23[2] (annual form). *E. thermophila* Greene, Pitt. 5:256 (1905), type loc. upper San Joaquin, *T. Brandegee* (annual form). *E. tristis* Fedde l.c. 170, type loc. Temecula, *Hall* 1978. *E. vernalis* Greene l.c. 258, type loc. Los Angeles and San Diego cos. *E. yainacensis* Greene l.c. 234, based on Yainax Indian Reservation, Ore., *E. M. Austin*, and Modoc Co., *M. S. Baker;* Fedde l.c. 161, fig. 21[17]; var. *modoecnsis* Fedde, Rep. Nov. Sp. 3:28 (1906), type loc. Modoc Co., *M. S. Baker*, June, 1893. Var. CROCEA Jepson. *E. crocea* Benth. Trans. Hort. Soc. ser. 2, 1:407 (1835), type a garden plant (Cal. seed, *Douglas*); Fedde in Engler, Pflzr. 4[104]:167, fig. 22[5]. Var. *longissima* Greene l.c. 241, type loc. Colusa Co., *T. Brandegee;* Fedde l.c. 168, fig. 22[9]. Var. *apiifolia* Greene l.c., type loc. Vacaville, *Jepson*. Var. MARITIMA Jepson. *E. maritima* Greene, Pitt. 1:60 (1887), type loc. Pt. Harris, San Miguel Isl., *Greene;* T. Brandegee, Zoe 5:175 (1903), under E. californica; Fedde in Engler, Pflzr. 4[104]:155, fig. 21[2] (1909). Var. STRICTA Jepson. *E. stricta* Greene, Pitt. 5:236 (1905), type loc. Snow Mt., Lake Co., *T. Brandegee*, June 22, 1891. *E. xylorrhiza* Greene l.c. 238, type loc. Snow Mt., Lake Co., *Brandegee*, Aug. 25, 1893; Fedde l.c. 164, fig. 22[4].

2. **E. minutiflora** Wats. Stems several to many, branching, leafy and floriferous, 2 to 12 inches high, from a slender sometimes branched taproot; herbage glabrous (rarely pubescent), often glaucous; flowers on slender peduncles little or not at all exceeding the foliage; torus tubular-campanulate, the rim not expanded but often obscurely fluted, a hyaline internal edge commonly a little projecting; petals 1 to 2⅔ lines long; seeds spherical or nearly so, reticulate.

Colorado and Mohave deserts, the bordering ranges, and north to Inyo Co.; east to Utah and Arizona. Apr.-June.

Locs.—Bishop Creek, Inyo Co., *Hall & Chandler* 7237; Pleasant Cañon, Panamint Mts., *Hall & Chandler;* *Barnwell, *K. Brandegee;* *Randsburg, *K. Brandegee* 34e; Daggett, *Jepson* 5846; Barstow, *Jepson* 5808; Stoddard's Well, *Jepson* 5917; Shay's Well (w. of Warren's Well), *Jepson* 5953; Palm Sprs., Mt. San Jacinto, *Parish* 4106; San Felipe Gap, *T. Brandegee* 1e; Vallecito, *Jepson & Dutton* 8911.

The following spms., which we have examined and determined as E. minutiflora Wats., have been segregated by Greene or Fedde as indicated: Pah Ute Peak, Kern Co., *Purpus* 5107 (*E. petrophila* Greene acc. Fedde in Engler, Pflzr. 4^{104}:196); Erskine Creek, Kern Co., *Purpus* 5324 (*E. minuscula* Greene acc. Fedde l.c. 188); Manzana, Antelope Valley, *Davy* 2489 (*E. modesta* Greene acc. Fedde l.c. 191); Ells, Leonis Valley, w. Mohave Desert, *Davy* 2593 (*E. multicaulis* Fedde acc. Fedde in Engler, Pflzr. 4^{104}:191), robust, diffusely much branched, perennial acc. Fedde, but the perennial character not apparent; *Alpine, Los Angeles Co., *Parish* 1951 (*E. modesta* Greene acc. Fedde l.c. 191); Mohave Desert, *N. C. Wilson*, June 14, 1893 (*E. micrantha* Greene acc. Fedde l.c. 192); *Bagdad, Mohave Desert, *Hall* 6081 (*E. micrantha* Greene acc. Fedde l.c.); Coyote Cañon, Colorado Desert, *Hall* 2781 (*E. micrantha* Greene acc. Fedde l.c.); Santa Maria Mts., *Schellenger*, Apr., 1905 (*E. micrantha* Greene acc. Fedde l.c.).

Var. **parishii** Jepson n. comb. Petals 4 to 6 (or 7) lines long.—Colorado Desert: San Felipe Gap, *T. Brandegee* 2e; *Colorado Desert, *T. Brandegee;* Mason's, Mason Valley, *K. Brandegee;* *Chuckawalla Sprs., *Hall* 5898. The following with petals 3 to 4 lines long are intergrades between the species and var. parishii: Panamint Mts., *Jepson* 7117 (Emigrant Cañon), 7055, 7067 (Hanaupah Cañon); Nelson Range, Inyo Co., *S. W. Austin;* Blue Mt., Greenhorn Range, *Hall & Babcock* 5006; Whitewater, e. of San Gorgonio Pass, *Parish* 6103. Var. **rutaefolia** Jepson n. comb. Stems slender, many from the base; leaves ternate or biternate, the lobes broadly cuneiform.—Havilah, Kern Co., *T. Brandegee*, May 15, 1891.

Refs.—ESCHSCHOLTZIA MINUTIFLORA Wats. Proc. Am. Acad. 11:122 (1876), type loc. nw. Nev. to Ariz. and s. Utah, *Parry;* Fedde in Engler, Pflzr. 4^{104}:194, fig. 24^{17} (1909). *E. covillei* Greene, Pitt. 5:275 (1905), type loc. Death Valley region, Inyo Co., *Coville & Funston* 334; Fedde l.c. 192, fig. 24^{12}. *E. micrantha* Greene l.c. 277, type loc. Mohave Desert, *Curran;* Fedde l.c. fig. 24^{12}; var. *fusigemmata* Fedde, Rep. Nov. Sp. 3:184 (1906), type loc. Palm Sprs., *Selman* in 1902; Fedde in Engler, Pflzr. 4^{104}:192, fig. 24^{15} (1909). *E. minuscula* Greene l.c. 270, type loc. Hawthorn, Nev., *M. E. Jones;* Fedde l.c. 188, fig. 24^{5}. *E. modesta* Greene, Pitt. 1:169 (1888), type loc. Los Angeles Co., *Parish* 1951; Fedde l.c. 191, fig. 24^{13}. *E. multicaulis* Fedde, Rep. Nov. Sp. 2:145 (1906), type loc. Leonis Valley, Los Angeles Co., *Davy* 2593; Fedde in Engler, Pflzr. 4^{104}:191, fig. 24^{11} (1909). *E. petrophila* Greene, Pitt. 5:283 (1905), type loc. Pah Ute Peak, Kern Co., *Purpus*. *E. pusilla* Greene l.c. 281, type loc. Kernville, Kern Co., *T. Brandegee*, May 13, 1891. *E. tortuosa* Greene l.c. 278, type loc. Byrne's Spr., ne. San Bernardino Mts., *Parish* in 1894; Fedde l.c. 193, fig. 24^{16}. Var. PARISHII Jepson. *E. parishii* Greene, Bull. Cal. Acad. 1:183 (1885), type loc. Colorado Desert, *Parish;* Fedde in Engler, Pflzr. 4^{104}:187, fig. 24^{3}. Var. RUTAEFOLIA Jepson. *E. rutaefolia* Greene, Pitt. 5:271 (1905), type loc. Havilah, Kern Co., *Brandegee*, Apr. 15, 1891; Fedde l.c. 188, fig. 24^{6}.

3. **E. elegans** Greene. Stout leafy-stemmed annual, much branched above the base, 1 foot high; herbage glaucous, glabrous or slightly scabrous; leaves very finely cut; torus narrow-campanulate, the scarious inner ring conspicuous; corolla ½ inch long; mature seeds reticulate.

Santa Barbara Islands. Apr.-May.

Locs.—Santa Cruz Isl., *T. Brandegee;* Santa Catalina Isl., *K. Brandegee*, May, 1889 (in part), *Geo. B. Grant* 3777 (in part); Pebbly Beach, Catalina Isl., *Reed* 2842.

Refs.—ESCHSCHOLTZIA ELEGANS Greene, Bull. Cal. Acad. 1:182 (1885), type loc. Guadalupe Isl.; Fedde in Engler, Pflzr. 4 ^{104}:187, fig. 24^{2} (1909). Var. *ramosa* Greene l.c., type loc. Guadalupe Isl. *E. ramosa* Greene, Bull. Torr. Club 13:217 (1886); Fedde l.c. 185, fig. 24^{4}. *E. trichophylla* Greene, Pitt. 5:268 (1905), type loc. Santa Cruz Isl., *T. Brandegee*, Apr., 1888. *E. crossophylla* Greene l.c. type loc. Santa Catalina Isl., *T. Brandegee*, May, 1889.

4. **E. lemmonii** Greene. Stems usually somewhat leafy, branching, 6 to 12 inches high; herbage more or less pubescent with white hairs; torus urn-shaped, glabrous, 3 to 4 lines long; calyptra white-pubescent; petals orange, ½ to 1 inch long; capsule 1¼ to 2½ inches long.

San Carlos Range, south through inner San Luis Obispo Co. May-June.

Locs.—*Alcalde, *Eastwood*, May 10, 1893, *T. Brandegee* in 1891. Var. **asprella** Jepson n. comb. Buds lightly pubescent to quite glabrous.—Plaskett Ranch, Kings City, *K. Brandegee* 33e; Waltham Creek, San Carlos Range, *Jepson* 2660.

Refs.—ESCHSCHOLTZIA LEMMONII Greene, W. Am. Sci. 3:157 (1887), type loc. Cholame, San Luis Obispo Co., *Lemmon* in 1887; Fedde in Engler, Pflzr. 199, fig. 24^{20} (1909). Var. *laxa* Greene, Pitt. 5:289 (1905), type loc. Alcalde, Fresno Co., *Eastwood*, May 10, 1893. Var. *cuspidata* Greene l.c. type loc. San Luis Obispo, *Jared* in 1893. *E. eximia* Greene l.c. 273, based on Zapato, Fresno Co., *T. Brandegee*, Mar. 27, 1893, and Alcalde, *T. Brandegee*, Mar. 30, 1893. *E. alcicornis* Greene l.c. 273, type loc. Alcalde, *T. Brandegee* in 1891; Fedde l.c. 190, fig. 24^{5}. *E. delitescens* Fedde l.c. 200 (1909), type loc. Alcalde, *T. Brandegee* in 1891. *E. urceolata* Eastw. Bull. Torr. Club 30:488 (1903), type loc. hills betw. Cuyama Valley and Carrizo Plains. Var. ASPRELLA Jepson. *E. asprella* Greene l.c. 272, type loc. San Miguelito Rancho, Monterey Co., *Eastwood*, May, 1897; Fedde l.c., 189, fig. 24^{3}.

5. **E. lobbii** Greene. (Fig. 124.) Scapose, 4 to 8 (or 11) inches high, the leaves in a basal or sub-basal tuft with comparatively few linear or linear-lanceolate to almost filiform divisions; petals light yellow, 3 to 6 lines long; seeds strongly muricate with flattened processes, i,e., bur-like.

Fig. 124. ESCHSCHOLTZIA LOBBII Greene. *a*, habit, × ⅜; *b*, seed, × 5.

Sterile gravelly or clay foothills and rolling valley plains, 1000 to 2000 ft.: Sierra Nevada foothills; foothills of inner North Coast Ranges and the Sacramento Valley. Mar.-Apr.

Locs.—Sacramento Valley: *Redding, *Nutting*, *M. S. Baker* 4; Manzanita Flat betw. South Fork Cottonwood Creek and Dibble Creek, Tehama Co., *Jepson;* Chico, *R. M. Austin* 93; *College City, Colusa Co., *Alice King;* *Marysville Buttes, *Heller* 7575; *Willow Branch, Sutter Co., *Jepson;* Violet sta., Solano Co., *Jepson;* Peaceful Glen Valley, nw. Solano Co., *Jepson*. Sierra Nevada foothills: Simpson Ranch, Sweetwater Creek, Eldorado Co., *K. Brandegee* 32e (processes on seeds farther apart and less pronounced); *Layne Ranch near Pilot Hill, Eldorado Co., *K. Brandegee* 31e; Folsom, *K. Brandegee;* Milton, Calaveras Co., *Davy* 1223; Table Mt., near Sonora, *Jepson* 6424; Linden, San Joaquin Co., *Gunnison;* Grapevine Spr., e. of Visalia, *Woolsey;* Lemon Cove, *Hopping;* Kaweah, *Hopping* 261; Middle Tule River, *Purpus* 5005 (*E. pulchella* Greene acc. Fedde in Engler, Pflzr. 4^{104}:201).

Refs.—ESCHSCHOLTZIA LOBBII Greene, Pitt. 5:290 (1905), type loc. nw. Solano Co., *Jepson;* Fedde in Engler, Pflzr. 4^{104}:205, fig. 24^{21} (1909). *E. tenuifolia* Hook. Bot. Mag. t. 4812 (1854), type an English garden plant (Veitch), undoubtedly from Cal. seed collected by Lobb; not *E. tenuifolia* Benth. *E. graminea* Fedde, Rep. Nov. Sp. 2:146 (1906), type loc. Table Mt., Plumas Co., *M. E. P. Ames* in 1867 (doubtfully placed here, no spms. seen). *E. pulchella* Greene l.c. 291, type loc. lowest foothills of n. Sierra Nevada; Fedde in Engler, Pflzr. 4^{104}.201, $24^{32, 33}$. *E. unguiculata* Greene l.c. 292, type loc. Madera, *Buckminster*.

6. **E. caespitosa** Benth. Stems usually scapose, several to many from a tuft of basal leaves, 3 to 9 inches high, far exceeding the leaves; herbage glaucous, glabrous or below somewhat hispidulous; leaves cut into rather numerous narrow lobes; torus turbinate to oblong-turbinate; petals pure yellow, ½ to 1 inch long; seeds longer than broad, abruptly acute, lightly reticulate or almost smooth.

South Coast Ranges, south to Los Angeles Co. Apr.-May.

Locs.—Monrovia, Los Angeles Co., *C. F. Baker* 4180; Mono Creek, Santa Barbara, *Hall* 7821; Santa Inez Mts., *T. Brandegee*.

Var. **rhombipetala** Jepson n. comb. Similar in habit but the scapes hardly exceeding the leaves; torus usually about twice as long as broad; petals fugacious; seeds reticulate-pitted.—Foothills and plains at east base of the Mt. Diablo Range (Byron, *Greene*).

Var. **hypecoides** Gray. Stems slender, leafy, somewhat branched, 3 to 12 (or 18) inches high; petals ⅓ to 1 inch long; seeds spherical or slightly elongate.—Fertile hillslopes: Sierra Nevada foothills from Kern Co. to Butte Co., about 1200 to 2500 ft.; Coast Ranges from Trinity Co. to Monterey Co., 100 to 2000 ft.

Locs.—Sierra Nevada: Kaweah, *Hopping* 81; Grapevine Sprs., e. of Visalia, *Woolsey*, Mar. 20, 1898; Dunlap, Fresno Co., *Jepson* 2761; ridge n. of Pinehurst, Fresno Co., *Newlon* 200 (fls. very deep orange); Knights Ferry, *Bancroft;* Duck Bar, Tuolumne River, *A. L. Grant* 714; Stanislaus River road near Parrott's Ferry, *A. L. Grant;* Jackson, Amador Co., *Hansen* 81; *Sweetwater Creek, Eldorado Co., *K. Brandegee* 25e, 26e; *Folsom to Placerville near

Indian Creek, *K. Brandegee* 27e; *Auburn, *K. Brandegee* 28e; South Peak, Marysville Buttes, *Jepson*, Apr. 20, 1891; Little Chico Creek, *R. M. Austin* 94. Coast Ranges: Ruth, Trinity Co., *Tracy* 4326 (very glaucous); Alder Sprs., Glenn Co., *Heller* 11440; betw. Lakeport and Hopland, *C. F. Baker* 3094 (*E. bakeri* Greene, Pitt. 5:284); Scotts Valley, Lake Co., *Tracy* 1865; Yolo Mts., *C. F. Baker* 2995 (*E. dumetorum* Greene l.c.); Mt. St. Helena, *C. F. Baker* 2614 (*E. formosa* Greene l.c. 288; Fedde in Engler, Pflzr. 4^{104}:198); Pope Valley grade from Calistoga, *Jepson*, May 2, 1893; Wooden Valley grade, Napa Range, *Jepson*, Apr. 28, 1893 (this specimen was compared by us with the type of *E. hypecoides* Benth. at the Herbarium of the Royal Botanic Gardens at Kew; it is plainly the equivalent of Bentham's type. It is also, however, a good match for the type of E. caespitosa Benth. in its flowers, buds and torus); Miller Cañon, Vaca Mts., *Jepson;* Gates Cañon, Vaca Mts., *Jepson* in 1892 (compared by us with the type of *E. hypecoides* Benth. at Kew); Mt. Tamalpais, *Jepson;* Big Sur River, Monterey Co., *Jepson* 2583; Big Creek, Santa Lucia Mts., *K. Brandegee* 30e.

Refs.—ESCHSCHOLTZIA CAESPITOSA Benth. Trans. Hort. Soc. ser. 2, 1:408 (1835), type from Cal., *Douglas;* Fedde in Engler, Pflzr. 4^{104}:197, fig. 24^{73} (1909). *E. tenuifolia* Benth. l.c., type from Cal., *Douglas. E. incisa* Greene, Pitt. 5:287 (1905), type loc. Soldiers Home, Los Angeles Co., *Hasse* (doubtfully placed here as no spms. seen). Var. RHOMBIPETALA Jepson. *E. rhombipetala* Greene, Bull. Cal. Acad. 1:71 (1885), type loc. "chiefly lower San Joaquin Valley, but also observed by Mrs. Curran in Colusa Co."; Fedde in Engler, Pflzr. 4^{104}:199, fig. 24^{29}. Var. HYPECOIDES Gray, Proc. Am. Acad. 22:272 (1887). *E. hypecoides* Benth. Trans. Hort. Soc. ser. 2, 1:408 (1835), type from Cal., *Douglas. E. austinae* Greene, Bull. Cal. Acad. 1:69 (1885), type loc. Butte Co., *R. M. Austin*, 1883. *E. bakeri* Greene, Pitt. 5:284 (1905), type loc. ridge betw. Lakeport and Hopland, Lake Co., *C. F. Baker* 3094; Fedde in Engler, Pflzr. 4^{104}:196, fig. 24^{23}. *E. biternata* Greene l.c. 271, type loc. upper Mad River, Trinity Co., *Blankinship. E. cruciata* Greene l.c. 279, type loc. Huron, Fresno Co., *Eastwood. E. dolichocarpa* Eastw. Bull. Torr. Club 30:487 (1903), type loc. Pt. Gorda, Santa Lucia Mts., *Plaskett* 84. *E. dumetorum* Greene l.c. 283, type loc. Yolo Mts., *C. F. Baker* 2995; Fedde l.c. fig. 24^{22}. *E. elmeri* Greene l.c. 286, type loc. Tassajara Hot Sprs., Monterey Co., *Elmer* 3268; Fedde l.c. 163, fig. 22^{2}. *E. flaccida* Fedde, Notizbl. Bot. Gart. u. Mus. Berl. 4^{35}:153 (1904), type loc. Loma Prieta, *Dudley;* Fedde in Engler, Pflzr. 4^{104}:195, fig. 24^{19} (1909). *E. formosa* Greene l.c. 288, type loc. Dry Creek betw. Napa and Sonoma cos., *C. F. Baker* 2614; Fedde l.c. 198, fig. 24^{26}; var. *urocalyx* Fedde, Rep. Nov. Sp. 3:184 (1906), type loc. Mt. St. Helena, *C. F. Baker* 2614; Fedde in Engler, Pflzr. 4^{104}:198, fig. 24^{27}. *E. pseudalcicornis* Fedde, Rep. Nov. Sp. 3:184 (1906), type loc. San Jose, *Keating;* Fedde in Engler, Pflzr. 4^{104}:190, fig. 24^{10} (1909). *E. tenuissima* Greene l.c. 285, type loc. Mariposa Co., *Congdon;* Fedde l.c. 197, fig. 24^{25}.

E. CARUIFOLIA Greene, Pitt. 5:281 (1905), type loc. Leesville, Colusa Co., *Brandegee,* Apr. 1889. *E. rostellata* Greene l.c. 282, type loc. Coloma, Eldorado Co., *Rixford,* May 30, 1901. Stems slender, very many from base, 3 to 7 in. high; leaves dissected into very narrow linear segments; petals 4 to 8 lines long. The spms. examined are as quoted above. The status of this form must remain doubtful until further collections are available.

7. **E. glyptosperma** Greene. Glaucous annual with densely tufted nearly equal basal leaves; stems numerous, scapose, slender, rather stiffly erect, usually 3 to 7 inches high, far exceeding the leaves; leaves much dissected into short crowded linear divisions; petals broad, 5 to 7 (or 10) lines long; capsule 1½ to 2 inches long; seeds globose, coarsely pitted and without reticulation, the pits rather distant.

Mohave Desert; east to Utah. May.

Locs.—Kramer, *K. Brandegee;* *Barstow, *K. Brandegee* 24e, 36e, *Jepson* 5357, 5809, 6150; *Daggett, *K. Brandegee* 35e; *Sheephole Mts., *Hall* 6044; Needles, *Ruby Warner;* Santa Maria Mts., *Schellenger,* Apr. 1905.

Refs.—ESCHSCHOLTZIA GLYPTOSPERMA Greene, Bull. Cal. Acad. 1:70 (1885), type loc. Mohave Desert, *Curran;* Fedde in Engler, Pflzr. 4^{104}:202, fig. 24^{32} (1909). *E. paupercula* Greene, Pitt. 5:262 (1905), type loc. Mohave Desert, *N. C. Wilson.*

FUMARIACEAE. FUMITORY FAMILY

Ours glabrous perennial herbs with alternate compound dissected leaves and irregular perfect flowers. Sepals 2, small and scale-like. Petals 4, in 2 dissimilar pairs, the outer larger, inner pair narrower, carinate or crested on the back, cohering by the callous apex and covering the anthers and stigma. Stamens in 2 sets of 3 each, placed opposite the outer petals, the filaments of each set usually united; middle anther of each set 2-celled, the lateral ones 1-celled. Ovary

superior. Capsule 1-celled, with 2 parietal rib-like placentae from which the valves separate, or indehiscent.—Genera 5 and species about 225, all continents except South America and Australia.

Bibliog.—Baillon, H., Fumarieae (Nat. Hist. Pl. 3:141–143,—1874). Gray, A., Corydalis aurea and its allies (Bot. Gaz. 11:188–189,—1886). Hutchinson, J., Genera of Fumariaceae and their distribution (Kew Bull. 1921:97–115).

Corolla 2-spurred or 2-saccate at base.....1. DICENTRA.
Corolla 1-spurred at base.....2. CORYDALIS.

1. **DICENTRA** Bernh. DUTCHMAN'S BREECHES

Flowers in racemes or panicles, or solitary. Corolla flattened and cordate at base. Filaments of each set dilated and united, but distinct at the very base and slightly free above.—Species 15, North America and Asia. (Greek dis, twice, and kentron, a spur, some species 2-spurred.)

Stems leafy, tall; flowers yellow, erect; corolla deciduous; petals distinct; crests of the inner petals tubular; seeds crestless.
Flowers sulphur-yellow; outer petals spreading or recurving to the middle; widely scattered. 1. *D. chrysantha.*
Flowers straw-yellow or cream-color; outer petals erect or only the tips spreading; seaward South Coast Ranges.....2. *D. ochroleuca.*
Stems naked, scape-like, the leaves all basal; flowers more or less nodding; corolla withering-persistent; sepals persistent or at least not caducous; seeds crested.
Flowers rose-purple; petals united; crests of inner petals tubular, conspicuous; scapes tall, bearing a cluster of racemes.....3. *D. formosa.*
Flowers whitish or flesh-color; petals distinct, the outer with narrow recurving tips; crests of inner petals none or obscure; diminutive alpine herbs, the scapes 1 or 2 (or 3)-flowered.
Recurving tips longer than the body of outer petals.....4. *D. uniflora.*
Recurving tips shorter than the body of outer petals.....5. *D. pauciflora.*

1. **D. chrysantha** Walp. GOLDEN EAR-DROPS. (Fig. 125.) Glaucous plants with stiff coarse leafy stems 2 to 5 feet high, arising from stout roots; leaves bipinnate, ½ to 1 foot long, the divisions cleft into narrow lobes; flowers yellow, in a large racemose panicle; corolla linear-oblong, only slightly cordate, 6 to 7 lines long; sepals somewhat caducous; outer petals spreading or recurving to the middle, saccate below the tip; crest of inner petals rather narrow, crisped or curly; capsule ¾ to 1¼ inches long.

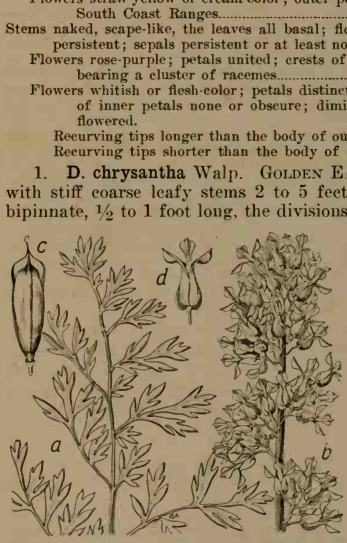

Fig. 125. DICENTRA CHRYSANTHA Walp. *a*, upper portion of leaf, × ½; *b*, inflorescence, × ½; *c*, capsule, × 1; *d*, flower, × 1.

High dry ridges of the inner ranges: Coast Ranges from Mendocino Co. southward; Sierra Nevada foothills from Calaveras Co. southward; Ventura Co. to San Diego Co. Widely distributed but not common. 1000 to 5350 feet. June.

Locs.—Mt. Sanhedrin, *Purpus* 1136; Knoxville grade to Lower Lake, *Jepson;* Miller Cañon, Vaca Mts., *Jepson;* Mt. Diablo, *Jepson;* Alma Soda Spr., Santa Clara Co., *Heller* 7506; Saratoga, *Davy* 389; Ojai Valley, *Olive Thacher;* Watson Spr., North Fork Kaweah River, *Jepson;* Middle Tule River, *Purpus* 5038; Mt. Markham, San Gabriel Mts., *Peirson* 56; San Bernardino, *Jepson* 5564; San Timoteo Cañon, *Jepson* 6083; Chalk Hill, San Jacinto Mts., *Hall* 2630; Palomar, *Hall;* Indian Cañon, Collins Valley, *Jepson* 8843.

Refs.—DICENTRA CHRYSANTHA Walp. Rep. 1:118 (1842). *Dielytra chrysantha* H. & A. Bot. Beech. 320, t. 73 (1840), type from California, *Douglas;* Jepson, Fl. W. Mid. Cal. 210 (1901). *Capnorchis chrysantha* Planch. Fl. Serres, 8:193, t. 820 (1853). *Bikukulla chrysantha* Cov. Contrib. U. S. Nat. Herb. 4:60 (1893).

2. **D. ochroleuca** Engelm. Similar to D. chrysantha, 2 to 3 feet high; panicle consisting of numerous flowers in one or few dense roundish clusters; sepals straw-color or brown, more persistent than in D. chrysantha; flowers pale or somewhat straw-yellow, 7/8 to 1 inch long; outer petals with only the tips spreading, the inner with purple tips and a broad crest.

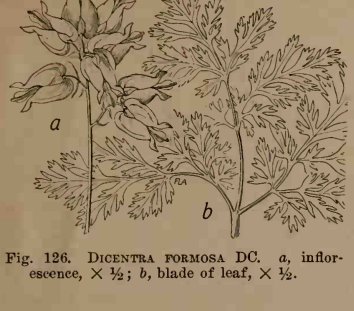

Fig. 126. DICENTRA FORMOSA DC. *a*, inflorescence, × ½; *b*, blade of leaf, × ½.

Santa Inez Mts. to the Santa Monica Mts. Apr.-June.

Locs.—Santa Inez Mts., *Dunn;* Painted Cave Ranch near Santa Barbara, *Eastwood;* Santa Clara Valley, Ventura Co., *Curran;* Santa Monica Mts., *Hasse.*

Refs.—DICENTRA OCHROLEUCA Engelm. Bot. Gaz. 6:223 (1881), type loc. Santa Monica Mts., *Engelmann. Diclytra ochroleuca* Greene, Pitt. 1:187 (1888). *Capnorchis ochroleuca* Greene, Fl. Fr. 279 (1891).

3. **D. formosa** DC. BLEEDING HEART. (Fig. 126.) Flowering stems naked, scape-like, 8 to 18 inches high, somewhat exceeding the leaves, terminated by a cluster of short racemes; rootstock fleshy and spreading; leaves all basal, on very long petioles, biternately compound, the divisions incisely cleft or pinnatifid; corolla rose-purple (rarely white), ovate-cordate, 7 to 9 lines long, the petals all united to above the middle.

Shady woods, Coast Ranges from Del Norte Co. to Alameda Co.; Sierra Nevada from Shasta Co. to Tulare Co. North to British Columbia. Apr.-June. Sometimes one free filament in each set of the stamens.

Locs.—Coast Ranges, 50 to 1500 feet: Crescent City, *Goddard;* Eureka, *Tracy* 2013; Sherwood, Mendocino Co., *F. Stephens;* Bodega, *Chandler* 669; Olema, *Jepson* 4033. Sierra Nevada, 1500 to 5000 feet: Hatchet Creek, Shasta Co., *Baker & Nutting;* Colby, Butte Co., *R. M. Austin;* Bear Valley, Nevada Co., *Jepson;* Avery Sta., Calaveras Co., *A. L. Grant;* Calaveras Big Trees, *A. L. Grant;* Yankee Hill, Columbia, *A. L. Grant* 673; Pine Ridge, Fresno Co., *Hall & Chandler* 74; Mt. Silliman, *Jepson* 751; Cedar Creek, North Fork Kaweah River, *Hopping;* Mt. Moses, North Fork Middle Tule River, *Purpus* 1345.

Refs.—DICENTRA FORMOSA DC. Syst. 2:109 (1821); Jepson, Fl. W. Mid. Cal. 210 (1901). *Fumaria formosa* Andr. Bot. Rep. 6: pl. 393 (1800), type loc. Nootka, *Menzies;* Sims, Bot. Mag. t. 1335 (1811). *Capnorchis formosa* Ktze. Rev. Gen. Pl. 15 (1891). *Bikukulla formosa* Cov. Contrib. U. S. Nat. Herb. 4:60 (1893).

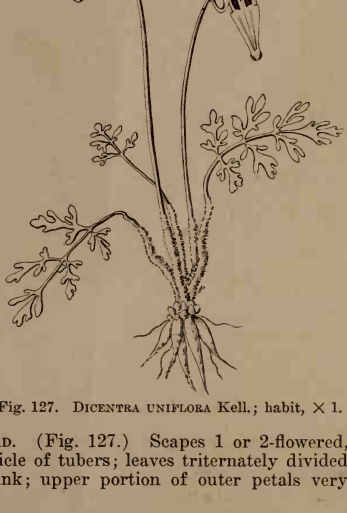

Fig. 127. DICENTRA UNIFLORA Kell.; habit, × 1.

4. **D. uniflora** Kell. STEER'S HEAD. (Fig. 127.) Scapes 1 or 2-flowered, 1 to 3 inches high, arising from a fascicle of tubers; leaves triternately divided into oblong lobes; flowers white or pink; upper portion of outer petals very

narrow, recurving to below the middle; inner petals spoon-shaped at apex, expanded downward, then abruptly truncate and borne by a claw-like base; fruiting scapes prostrate.

Rocky slopes, 6000 to 12,000 feet, Sierra Nevada from Fresno Co. north to Siskiyou Co., thence southerly to Humboldt Co. North to Washington, east to Utah.

Locs.—South Fork Mt., Humboldt Co., *Blasdale;* Trinity Summit, *Davy* 5816; Mt. Bidwell, *Austin & Bruce;* Soupan Sprs., Lassen Peak, *Hall & Babcock* 4298; Truckee, *Sonne;* betw. Angora Peak and Keith's Dome, *Alice M. Ottley* 799; Tilden Lake, *Jepson* 4556; Macomb Ridge, Yosemite Park, *Jepson* 4557; Mt. Dana, *Jepson;* Mt. Lyell, *Jepson* 3331; Nellie Lake, Fresno Co., *A. L. Grant* 1018.

Refs.—DICENTRA UNIFLORA Kell. Proc. Cal. Acad. 4:141, fig. (1871), type loc. Placer Co. (Cisco and Summit); Jepson, Sierra Club Bull. 8:266–269 (1912). *Diclytra uniflora* Greene, Pitt. 1:187 (1888). *Capnorchis uniflora* Ktze., Rev. Gen. Pl. 15 (1891). *Bikukulla uniflora* Howell, Fl. Nw. Am. 34 (1897).

5. **D. pauciflora** Wats. Scapes 4 to 5 inches high, 1 to 3-flowered, arising from fleshy creeping rootstocks; leaves similar to D. uniflora; flowers white or flesh-color, outer petals with saccate spur, the upper portion linear-oblong, 4 lines long, recurving or widely spreading; inner petals narrow or ligulate, abruptly expanded into a spatulate apex, contracted at base and borne on a much dilated or oblong claw as long as the blade proper.

Alpine, 9000 to 10,000 feet, localized in two widely separated regions: Salmon Alps, Scott and Trinity mountains; Sawtooth Range, Tulare Co.

Locs.—Union Lake Valley, Salmon Mts., *Hall* 8623; Mineral King (Contrib. U. S. Nat. Herb. 4:60); Mt. Moses, *Purpus* 1340.

Refs.—DICENTRA PAUCIFLORA Wats. Bot. Cal. 2:429 (1880), based on spms. from Scott Mts., *Greene,* and Castle Lake, Trinity Mts., *Lemmon. Diclytra pauciflora* Greene, Pitt. 1:187 (1888). *Bikukulla pauciflora* Cov. Contrib. U. S. Nat. Herb. 4:60 (1893). *Capnorchis pauciflora* Greene, Fl. Fr. 279 (1891).

2. CORYDALIS Vent.

Stems with ample 2 or 3-pinnate leaves. Flowers in racemes. Corolla with only one of the outer petals spurred or gibbous, this becoming posterior by the torsion of the flower; petals all erect and connivent up to the engaged tips of the outer ones. Filaments with nectar-bearing process projecting into the petal-spur. Seeds with a concave aril-like crest.—Species 90, North America, Europe, Asia, Africa. (Greek Korydallis, the ancient name of the crested lark.)

Flowers white or cream-color; spur 1½ to 2 times as long as the petals.....1. *C. caseana.*
Flowers yellow; spur barely ½ as long as the petals.....2. *C. aurea.*

1. **C. caseana** Gray. Stem 1½ to 3 feet high, arising from thickened roots; leaves ½ to 1¼ feet long; leaflets ovate, mucronate, 3 to 9 lines long; raceme dense, 1½ to 3 inches long; corolla white or cream-color, with bluish tips; petals 4 to 5 lines long, the spur nearly straight, 1½ to 2 times as long.

Northern Sierra Nevada from Nevada Co. to Plumas Co., 5000 to 6300 feet.

Locs.—Truckee River, Placer Co., *Sonne;* Indian Valley, Plumas Co., *Lemmon;* Jamison Creek, Plumas Co., *Hall* 9308; Butte Creek, *Hall* 9796; Big Meadows, Plumas Co., *Cleveland;* Morgan, Tehama Co., *Hall & Babcock* 4291.

Refs.—CORYDALIS CASEANA Gray, Proc. Am. Acad. 10:69 (1874), type loc. Big Mdws., Plumas Co., *Lemmon, E. L. Case. Capnoides caseanum* Greene, Fl. Fr. 280 (1891). *Corydalis bidwelliae* Wats. Bot. Cal. 2:429 (1880), type loc. Sierra Nevada above Chico, *Annie Bidwell. Capnodes bidwellianum* Greene l.c.

2. **C. aurea** Willd. Branching from the base, spreading, about 10 inches high; leaves finely dissected; raceme few-flowered, short, the pedicels 1 to 2 lines long; flowers yellow; petals 3½ to 4 lines long, the spur about half as long; capsules terete, at length torulose, 10 lines long; seeds black, glossy.

Mono Co., 6900 to 7000 feet. Rocky Mts. to Alaska and Nova Scotia.

Loc.—Betw. Pickle Mdws. and Hardy sta., *Alice M. Ottley* 1133.

Refs.—CORYDALIS AUREA Willd. Enum. 740 (1809), type loc. Canada; Gray, Gen. Pl. U. S. 1:124, pl. 52 (1848). *Fumaria aurea* Ker. Bot. Reg. t. 66 (1815). *Capnoides aureum* Ktze. Rev. Gen. Pl. 14 (1891).